

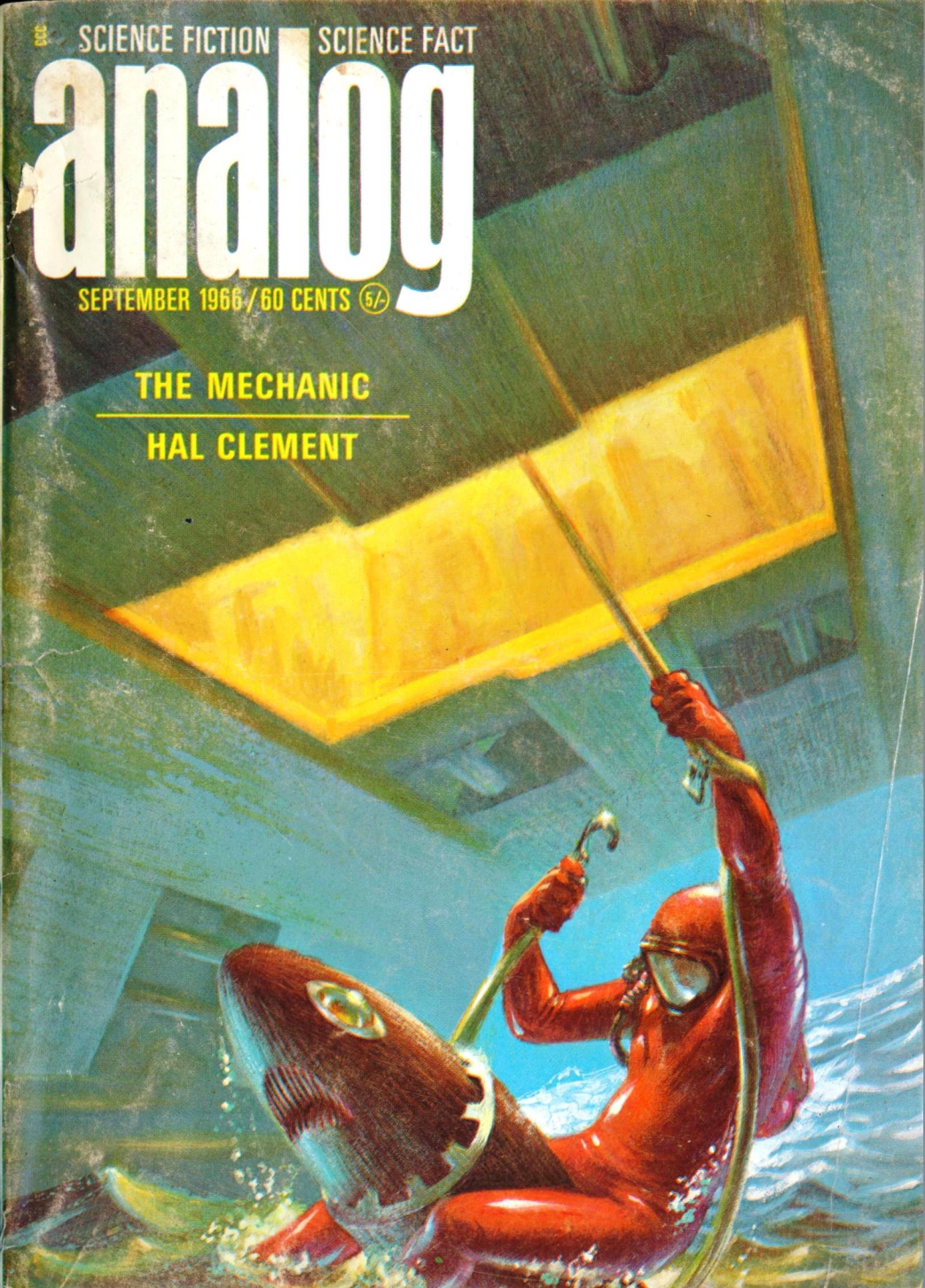
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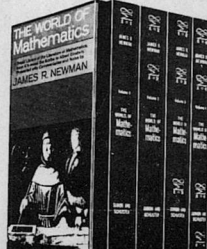
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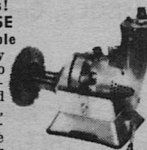
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
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POLLUTION

There's a basic biological law that no organism can live in a medium of its own by-products.

That law does not apply only to creatures under a microscope, or a few fish in a living-room aquarium; it applies also to astronauts in a space capsule—and to a culture of intelligent beings living on a planet.

Currently, we're astronauts living in an eight thousand mile diameter spaceship, with a life-support system that's rapidly breaking down due to an excessive increase in by-products of new and unusual types, plus an enormous increase in one type of organism that's unbalancing the essential symbiosis.

The worst problem stems from the fantastically proliferating new genus *mechanistria*, which consumes assorted mineral foodstuffs, and produces an immense efflux of by-products of totally new kinds, and of virulent character.

In an ecology, if a new type of creature evolves, there will, presently, evolve a new type of predator to keep it in check, and a new type of scavenger to live on its by-products. Occasionally there will be a temporary unbalance—but these aren't ordinarily important in geologic time. Currently Australia, for example,

has two problems of the unbalanced ecology type: the fairly widely known one concerning rabbits, and a less well-known—but almost equally serious—one concerning the by-products of one of Australia's major economic industries, cattle-raising.

The rabbit problem arose because the highly prolific beasts were introduced without adequate predatory opposition. They didn't also introduce foxes and coyotes.

The cattle problem is, simply, that there never were any cattle, or cattle-like animals in Australia before Man brought his herds in—and therefore, there were no dung-scavenger organisms in Australia. The problem resulting is one that, at first glance, sounds silly—but it turned out to be anything but laughable. A cow-pat, in Australian pastures, takes up to five years to disintegrate; meanwhile it encourages the growth around it of a rank, tough grass that cattle won't eat.

In Africa, under good conditions, a similar cow-pat lasts about twenty minutes before the numerous and vigorously effective scavenger beetles and assorted insects have dispersed and/or buried it. Africa, of course, has had numerous varieties of cattle for geologic ages—a fully de-

veloped ecology has things well under control.

In American pastures, a similar situation exists; dung-beetles of various sorts break up and/or bury the cow's by-products, which are rapidly converted to useful raw material for the pasture grasses.

Australian government scientists have recently imported some thirty varieties of dung scavengers—because the blocked-out-of-production pasture area, due solely to unscavenged dung, meant an annual loss of something like \$7,000,000 a year to the cattle industry!

In a working ecology, scavengers are clearly just as important for the survival of the system as any other link in the chain.

The brain may seem to a man The Vital Organ—but while it takes a little longer to die due to destruction of the scavenging system, the kidneys, it's just as lethal.

Since the days of the Industrial Revolution, the genus *mechanistria* has been proliferating in numbers, and evolving in size. At first they departed only slightly from the age-old previous ecology—their skeleton and limbs were made of wood, with only a few metal fastenings, and their muscles were water-powered. They consumed little new types of foodstuffs, and produced no new types of by-products.

When steam power became available, they grew faster, larger—and consumed new types of foods. They began to have metal skeletons and

limbs, and to produce new chemical by-products.

Currently, the quantities of iron and other metals that are being smelted, and the coal used to reduce the ores, yield immense tonnages of carbon dioxide—releasing into the atmosphere oxygen that's been fossilized in metal oxides for geologic epochs. But—oxygen only in the form of carbon monoxide and dioxide, plus millions of tons of sulfur di- and tri-oxide.

The release of sulfur oxides from major copper and nickel smelting plants, where the mineral sulphide ores are roasted to the oxide before reduction to the metal, have denuded square miles of vegetation.

The fossil carbon that's been consumed, and the other fossil fuels, have added almost immeasurable tonnages of carbon oxides to the atmosphere. Fortunately, carbon oxides are a very old and familiar by-product to Terrestrial life forms; it's soluble in water, and the enormous masses of ocean water can absorb the sudden excess and hold it in solution for a while. Plants consider it not a waste, but a food, of course, and can thrive on it.

As yet, the real problems of atmosphere pollution are relatively local; only where Man and his machines are in very high concentration, or where he has set up exceptionally large poison-emitting smelting operations, do we have genuinely lethal conditions. So far, the problem is one of local concen-

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trations—a city or a county poisoning itself, as Los Angeles and New York are.

But . . . consider this: In Isaac Asimov's "Foundation" series, the planet Trantor was the capital of the Galactic Empire—a whole planet made one immense city, the entire world roofed over in level over level of dwellings, and offices for the scores of billions of clerks, bureaucrats and politicians who ran a galaxy.

Such a world-city is impossible, if the inhabitants have a high standard of living.

Suppose that all their power is generated by hydrogen fusion, so that there is no problem of CO₂ waste to be cleaned from the air.

That the oxygen needed by all the living people on the planet is supplied synthetically—it'll have to be supplied somehow, if the whole planet's been converted to sterile city areas—and the air-purification machinery is so highly developed it even cleans out all the thousands of trace-contaminants man and his activities inevitably put into it. (*Something* has to consume the alcohol every normal living human organism constantly produces and exhales, or on such a planet the alcohol concentration in the air would rise to a level of a universal and inescapable drunkenness!)

Now if it's what *we*, even now, would consider a high-level culture,

continued on page 174

Drifting idly, the *Shark* tended to look more like a manta ray than her name suggested; but at high cruise, as she was now, she bore more resemblance to a flying fish. She was entirely out of the water except for the four struts that carried her hydroplanes; the air propellers which drove her were high enough above the surface to raise very little spray. An orbiting monitor satellite could have seen the vessel herself from a

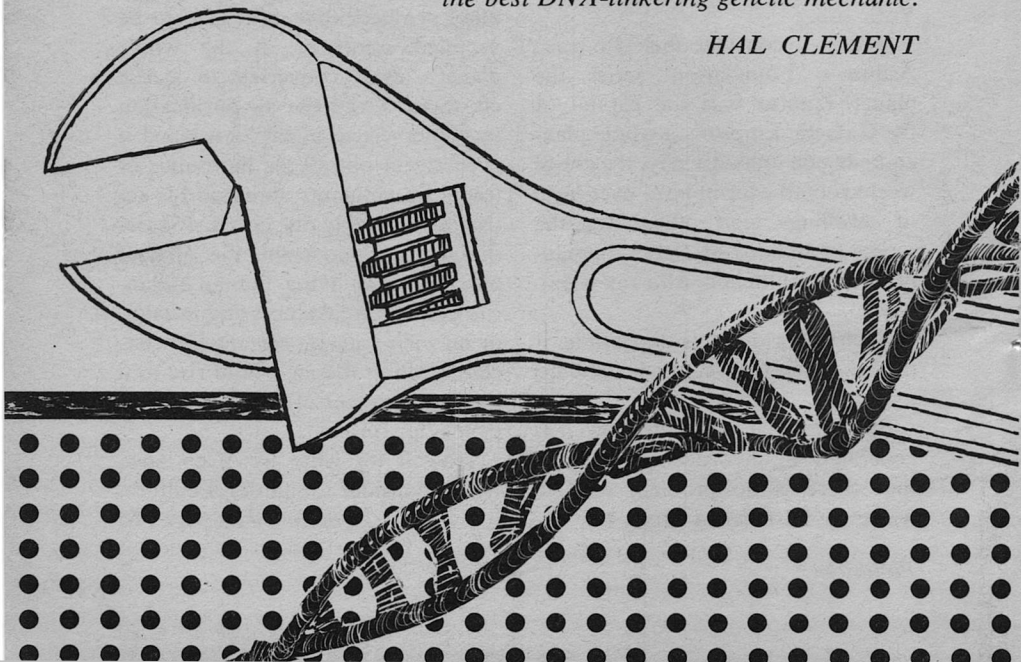
hundred miles up, since her upper hull was painted in a vividly fluorescent pattern of red and yellow; but there was not enough wake to suggest to such a watcher that the wedge-shaped machine was traveling at nearly sixty-five knots.

Chester V. Winkle—everyone knew what the middle initial stood for, but no one mentioned it in his presence—sat behind the left bow port of his command with his fingers

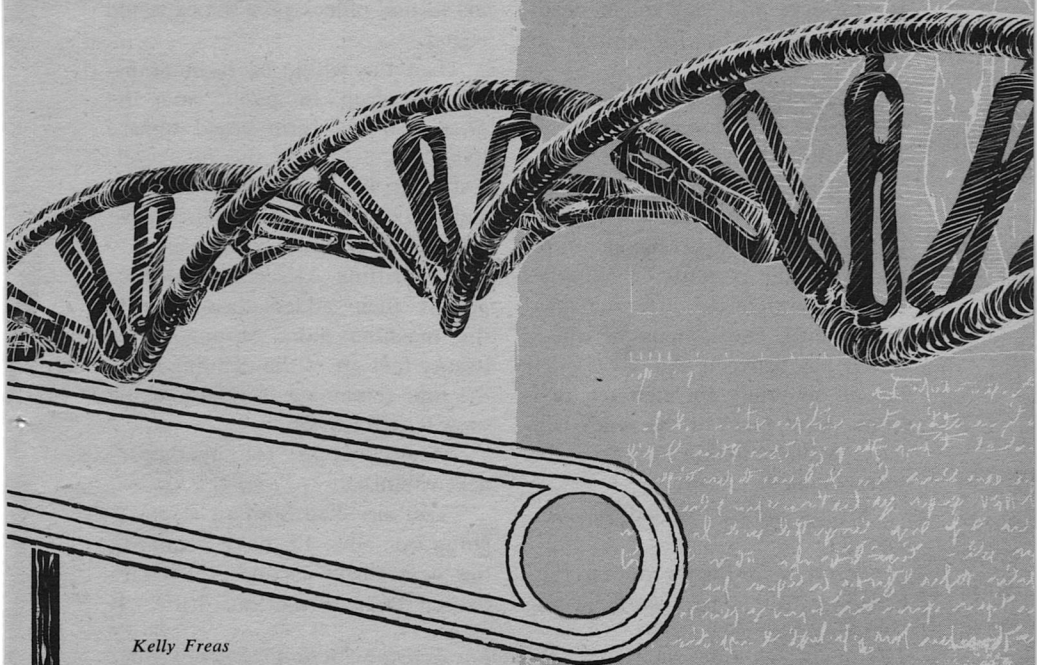
The Mechanic

It started out a simple job of repairing some diseased zeowhales—but from there it got worse, winding up with something beyond the abilities of even the best DNA-tinkering genetic mechanic.

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resting lightly on the pressure controls. He was looking ahead, but knew better than to trust his eyes alone. Most of his attention was devoted to the voice of the smaller man seated four feet to his right, behind the other "eye" of the manta. Yoshii Ishihara was not looking outside at all; his eyes were directed steadily at the sonar display screen which was all that stood between the *Shark* and disaster at



her present speed among the ice floes and zeowhales of the Labrador Sea.

"Twenty-two targets in the sweep; about fourteen thousand meters to the middle of the group," he said softly.

"Heading?" Winkle knew the question was superfluous; had a change been in order, the sonarman would have given it.

"As we go, for thirty-two hundred meters. Then twenty-two mils starboard. There's ice in the way."

"Good. Any data on target condition yet?"

"No. It will be easier to read them when we stop, and will cost little time to wait. Four of the twenty-two are drifting, but the sea is rich here and they might be digesting. Stand by for change of heading."

"Ready on your call." There was silence for about a minute.

"Starboard ten."

"Starboard ten." The hydroplanes submerged near the ends of the *Shark's* bow struts banked in response to the pressure of Winkle's fingers, though the hull remained nearly level. The compass needle on the panel between the view ports moved smoothly through ten divisions. As it reached the tenth Ishihara, without looking up from his screen, called, "Steady."

"Steady she is," replied the commander.

"Stand by for twelve more to starboard—now." The *Shark* swung

again and steadied on the new heading.

"That leaves us a clear path in," said the sonarman. "Time to engine cut is four minutes."

In spite of his assurance that the way was clear, Ishihara kept his eyes on his instrument—his standards of professional competence would permit nothing less while the *Shark* had way on her. Winkle, in spite of the sleepy appearance which combined with his name to produce a constant spate of bad jokes, was equally alert for visible obstructions ahead. Several ice floes could be seen; but none were directly in the vessel's path, and Winkle's fingers remained idle until his second officer gave the expected signal.

Then the whine of turbines began to drop in pitch, and the *Shark's* broad form eased toward the swell below as the hydrofoils lost their lift. The hull extensions well out on her "wings" which gave the vessel catamaran-type stability when drifting kissed the surface gently, their added drag slowing the machine more abruptly; and twenty feet aft of the conning ports the four remaining members of the crew tensed for action.

"Slow enough for readings?" asked Winkle.

"Yes, sir. The homing signal is going out now. I'll have counts in the next thirty seconds." Ishihara paused. "One of the four drifters is

underway and turning toward us. No visible response from the others."

"Which is the nearest of the dead ones?"

"Fifteen hundred meters, eight hundred forty mils port." Winkle's fingers moved again. The turbines that drove the big, counter-rotating air propellers remained idle, but water jets playing from ducts on the hydrofoil struts swung the ship in the indicated direction and set her traveling slowly toward the drifter. Winkle called an order over his shoulder.

"Winches and divers ready. The trap is unsafetied. Contact in five minutes."

"Winch ready," Dandridge's deep voice reported as he swept his chessboard to one side and closed a master switch. Mancini, who had been facing him across the board, slipped farther aft to the laboratory which occupied over half of the *Shark's* habitable part. He said nothing, since no order had been directed at him, and made no move to uncage any of his apparatus while the vessel was still in motion.

"Divers standing by." Farrell spoke for himself and his assistant after a brief check of masks and valves—both were already dressed for Arctic water. They took their places at either side of the red-checked deck area, just forward of the lab section, which marked the main hatch. Dandridge, glancing up to make sure that no one was

standing on it, opened the trap from his control console. Its halves slid smoothly apart, revealing the chill green liquid slipping between the hulls. At the *Shark's* present speed she was floating at displacement depth, so that the water averaged about four meters down from the hatch; but this distance was varied by a swell of a meter or so. Farrell stood looking down at it, waiting patiently for the vessel to stop; his younger assistant dropped prone by the edge of the opening and craned his neck through it in an effort to see forward.

Ishihara's voice was barely audible over the wind now that the hatch was open, but occasional words drifted back to the divers. "Six hundred . . . as you go . . . four . . . three . . ."

"I see it," Winkle cut in. "I'll take her." He called over his shoulder again, "Farrell . . . Stubbs . . . we're coming up on one. You'll spot it in a minute. I'll tell you when I lose it under the bow."

"Yes, sir," acknowledged Farrell. "See it yet, Rick?"

"Not yet," was the response. "Nothing but jellyfish."

"Fifty meters," called the captain. "Now thirty." He cut the water jets to a point where steerage way would have been lost if such a term had meant anything to the *Shark*, and continued to inch forward. "Twenty."

"I see it," called Stubbs.

"All right," answered the captain.

"Ten meters. Five. It's right under me; I've lost it. Con me, diver."

"About five meters, sir. It's dead center . . . four . . . three . . . two . . . all right, it's right under the hatch. Magnets ready, Gil?"

The magnetic grapple was at the forward end of its rail, directly over the hatch, so Dandridge was ready; but Winkle was not.

"Hold up . . . don't latch on yet. Stubbs, watch the fish; are we drifting?"

"A little, sir. It's going forward and a little to port . . . now you're stopping it . . . there."

"Quite a bit of wind," remarked the captain as his fingers lifted from the hydrojet controls. "All right. Pick it up."

"Think the magnets will be all right, Marco?" asked Dandridge. "That whale looks funny to me." The mechanic joined the winchman and divers at the hatch and looked down at their floating problem.

At first glance the "whale" was ordinary enough. It was about two meters long, and perfectly cigar-shaped except where the intake ring broke the curve some forty centimeters back of the nose. The exhaust ports, about equally far from the tail end, were less visible since they were merely openings in the dark gray skin. Integument and openings alike were hard to see in detail, however; the entire organism was overgrown with a brownish, slimy-looking mass of filaments reminis-

cent both of mold and of sealskin.

"It's picked up something, all right," Mancini conceded. "I don't see why your magnets shouldn't work, though . . . unless you'd rather they didn't get dirty."

"All right. Get down the ladder and steer 'em, Rick." Dandridge caused a light alloy ladder to extend from the bow edge of the hatch as he spoke; then he fingered another switch which sent the grapples themselves slowly downward. Stubbs easily beat them to the foot of the ladder, hooked one leg through a rung, reached out with both arms and tried to steady the descending mass of metal. The *Shark* was pitching somewhat in the swell, and the eighty pounds of electromagnet and associated wiring was slightly rebellious. The youngest of the crew and the only nonspecialist among its members—he was still working off the two-year labor draft requirement which preceded higher education—Rick Stubbs got at least his share of the dirty work. He was not so young as to complain about it.

"Slower . . . slower . . . twenty c's to go . . . ten . . . hold it now . . . just a touch lower . . . all right, juice!" Dandridge followed the instructions, fed current to the magnets, and started to lift.

"Wait!" the boy on the ladder called almost instantly. "It's not holding!"

The mechanic reacted almost as fast.

"Bring it up anyway!" he called. "The infection is sticking to the magnets. Let me get a sample!" Stubbs shrank back against the ladder as the slimy mass rose past him in response to Mancini's command. Dandridge grimaced with distaste as it came above deck level and into his view.

"You can have it!" he remarked, not very originally.

Mancini gave no answer, and showed no sign of any emotion but interest. He had slipped back into his lab as the material was ascending, and now returned with a two-liter flask and the biggest funnel he possessed.

"Run it aft a little," he said briefly. "That's enough . . . I'll miss some, and it might as well fall into the water as onto the deck." The grapple, which had crawled a few inches toward him on its overhead rail, stopped just short of the after edge of the hatch. Mancini, standing unconcernedly at the edge of the opening with the wind ruffling his clothes, held funnel and flask under the magnets.

"All right, Gil, drop it," he ordered. Dandridge obeyed.

Most of the mess fell obediently away from the grapple. Some landed in the funnel and proceeded to ooze down into the flask; some hit Mancini's extended arm without appearing to bother him; a little dropped onto the deck, to the winchman's visible disgust. Most fell past Stubbs back into the sea.

The mechanic took up some of the material from his arm and rubbed it between thumb and forefinger. "Gritty," he remarked. "And the magnets held this stuff, but not the whale's skeleton. That means that most of the skeleton must be gone, and I bet this grit is magnetite. I'll risk a dollar that this infection comes from that old 775-Fe-DE6 culture that got loose a few years ago from Passamaquoddy. I'll give it the works to make sure, though. You divers will have to use slings to get the fish aboard, I'm afraid."

"Rick, I'll send the magnets down first and you can rinse 'em off a bit in the water. Then I'll run out the sling and you can get it around the whale."

"All right, sir. Standing by." As the grapple went down again Dandridge called to the mechanic, who had turned back toward the lab.

"I suppose the whale is ruined, if you're right about the infection. Can we collect damages?" Mancini shook his head negatively.

"No one could collect from DE; they went broke years ago—from paying damages. Besides, the courts decided years ago that injury or destruction of a piece of pseudolife was recoverable property damage only if an original model was involved. This fish is a descendant of a model ten years old; it was born at sea. We didn't make it, and can't recover for it." He turned to his

bench, but flung a last thought over his shoulder. "My guess that this pest is a DE escapee could be wrong, too. They worked out a virus for that strain a few months after it escaped, and I haven't heard of an iron infection in four years. This may be a mutation of it—that's still my best guess—but it could also be something entirely new." He settled himself onto a stool and began dividing the material from the flask into the dozens of tiny containers which fed the analyzers.

In the water below, Stubbs had plunged from the ladder and was removing slime from the grapple magnets. The stuff was not too sticky, and the grit which might be magnetite slightly offset the feeling of revulsion which the boy normally had for slimy materials, so he was able to finish the job quickly enough to keep Dandridge happy. At Rick's call, the grapple was retracted; a few moments later the hoist cable came down again with an ordinary sling at its extremity. Stubbs was still in the water, and Farrell had come part way down the ladder. The chief diver guided the cable down to his young assistant, who began working the straps around the torpedolike form which still bobbed between the *Shark's* hulls.

It was quite a job. The zeowhale was still slippery, since the magnets had not come even close to removing all the foreign growth. When the boy tried to reach around it to

fasten the straps it slithered away from him. He called for more slack and tried to pin it against one of the hulls as he worked, but still it escaped him. He was too stubborn to ask for help, and by this time Farrell was laughing too hard to have provided much anyway.

"Ride him, Buster!" the chief diver called as Stubbs finally managed to scissor the slippery cylinder with his legs. "That's it . . . you've got him dogged now!"

The boy hadn't quite finished, actually, but one strap did seem secure around the forward part of the hull. "Take up slack!" he called up to the hatch, without answering Farrell's remark.

Dandridge had been looking through the trap and could see what was needed; he reached to his control console and the hoist cable tightened.

"That's enough!" called Stubbs as the nose of the zeowhale began to lift from the water. "Hold it until I get another strap on, or this one will slip free!"

Winches obediently ceased purring. With its motion restrained somewhat, the little machine offered less opposition to the attachment of a second band near its stern. The young swimmer called, somewhat breathlessly, "Take it up!" and paddled himself slowly back to the ladder. Farrell gave him a hand up, and they reached the deck almost as quickly as the specimen.

Dandridge closed the hatch without waiting for orders, though he left the ladder down—there would be other pickups in the next few minutes, but the wind was cold and loud. Stubbs paid no attention; he barely heard the soft “Eight hundred meters, seventy-five mils to starboard,” as he made his way around the closing hatch to Mancini’s work station. The mechanic’s job was much more fascinating than the pilot’s.

He knew better than to interrupt a busy professional with questions, but the mechanic didn’t need any. Like several other men, not only on the *Shark* but among the crew of her mother ship, Mancini had come to like the youngster and respect his general competence; and like most professionals, his attitude toward an intelligent labor draftee was a desire to recruit him before someone else did. The man, therefore, began to talk as soon as he noticed the boy’s presence.

“You know much about either chemical or field analysis, Rick?”

“A little. I can recognize most of your gear—untracentrifuge, chromatographic and electrophoretic stuff, NMR equipment, and so on. Is that,” he pointed to a cylindrical machine on another bench, “a diffraction camera?”

“Good guess. It’s a hybrid that a friend of mine dreamed up which can be used either for electron microphotography or diffraction work.

All that comes a bit later, though. One thing about analysis hasn’t changed since the beginning; you try to get your initial sample into as many different homogeneous parts as possible before you get down to the molecular scale.”

“So each of these little tubes you’re filling goes through centrifuge, or solvation, or electrophoresis—”

“More usually, through all of them, in different orders.”

“I should think that just looking at the original, undamaged specimen would tell you *something*. Don’t you ever do that?”

“Sure. The good old light microscope will never disappear; as you imply, it’s helpful to see a machine in its assembled state, too. I’ll have some slides in a few more seconds; the mike is in that cabinet. Slide it out, will you?”

Stubbs obeyed, literally since the instrument was mounted on a track. The designers of the *Shark*’s laboratory had made it as immune to rough weather as they could. Mancini took the first of his slides, clipped it under the objective, and took one look.

“Thought so,” he grunted. “Here, see for yourself.”

Stubbs applied an eye to the instrument, played briefly with the fine focus—he had the normal basic training in fundamental apparatus—and looked for several seconds.

“Just a mess of living cells that don’t mean much to me, and a lot

of little octahedra. Are they what you mean?"

"Yep. Magnetite crystals, or I'm a draft-dodger." (His remark had no military significance; the term now referred to individuals who declined the unskilled-labor draft, voluntarily giving up their rights to higher education and, in effect, committing themselves to living on basic relief.) "We'll make sure, though." The mechanic slid another piece of equipment into position on the microscope stage, and peered once more into the field of view. Stubbs recognized a micromanipulator, and was not surprised when Mancini, after two minutes or so of silent work, straightened up and removed a small strip of metal from it. Presumably one of the tiny crystals was now mounted on the strip.

The mechanic turned to the diffraction camera, mounted the bit of metal in a clamp attached to it, and touched a button which started specimen and strip on a journey into the camera's interior. Moments later a pump started to whine.

"Five minutes to vacuum, five more for scanning," he remarked. "We might as well have a look at the fish itself while we wait; even naked-eye examination has its uses." He got up from his seat, stretched, and turned to the bench on which the ruined zeowhale lay. "How much do you know about these things, Rick? Can you recognize this type?"

"I think so. I'd say it was a cop-

per-feeder of about '35 model. This one would be about two years old."

"Good. I'd say you were about right. You've been doing some reading, I take it."

"Some. And the *Guppy's* shop is a pretty good museum."

"True enough. Do you know where the access regions are on this model?"

"I've seen some of them opened up, but I wouldn't feel sure enough to do it myself."

"It probably wouldn't matter if you did it wrong in this case; this one is safely dead. Still, I'll show you; better see it right than do it wrong." He had removed the straps of the sling once the "fish" had been lowered onto a rack on the bench, so nothing interfered with the demonstration. "Here," he pointed, "the reference is the centerline of scales along the back, just a little lighter in color than the rest. Start at the intake ring and count eight scales back; then down six on either side, like that. That puts you on this scale . . . so . . . which you can get under with a scalpel at the start of the main opening." He picked up an instrument about the size of a surgical scalpel, but with a blunt, rounded blade. This he inserted under the indicated scale. "See, it comes apart here with very light pressure, and you can run the cut back to just in front of the exhaust vents—like that. If this were a living specimen, the cut would heal under sealant spray in about an hour

after the fish was back in the water. This one . . . hm-m-m. No wonder it passed out. I wonder what this stuff is?"

The body cavity of the zeowhale was filled with a dead-black jelly, quite different in appearance from the growth which had covered the skin. The mechanic applied retractors to the incision, and began silently poking into the material with a variety of "surgical" tools. He seemed indifferent to the feelings which were tending to bring Stubbs' stomach almost as much into daylight as that of the whale.

Pieces of rubbery internal machinery began to litter the bench top. Another set of tiny test tubes took samples of the black jelly, and followed their predecessors into the automatic analyzers. These began to hum and sputter as they went to work on the new material—they had long since finished with the first load, and a pile of diagrams and numerical tables awaited Mancini's attention in their various delivery baskets. He had not even taken time to see whether his guess about magnetite had been good.

Some of the organs on the desk were recognizable to the boy—for any large animal, of course, a heart is fairly obviously a heart when it has been dissected sufficiently to show its valve structure. A four-kilogram copper nugget had come from the factory section; the organism had at least started to fulfill its intended purpose before disease

had ended its pseudolife. It had also been developing normally in other respects, as a twenty-five centimeter embryo indicated. The zeowhales and their kindred devices reproduced asexually; the genetic variation magnification, which is the biological advantage of sex, was just what the users of the pseudo-organisms did not want, at least until some factor could be developed which would tend to select for the characteristics they wanted most.

Mancini spent more than an hour at his rather revolting task before he finally laid down his instruments. Stubbs had not been able to watch him the whole time, since the *Shark* had picked up the other two unresponsive whales while the job was going on. Both had been infected in the same way as the first. The boy was back in the lab, though, when the gross dissection of the original one was finished. So was Winkle, since nothing more could be planned until Mancini produced some sort of report.

"The skeleton was gone completely," was the mechanic's terse beginning. "Even the unborn one hadn't a trace of metallic iron in it. That was why the magnets didn't hold, of course. I haven't had time to look at any of the analysis reports, but I'm pretty certain that the jelly in the body cavity and the moldy stuff outside are part of the same life form, and that organism dis-

solved the metallic skeleton and precipitated the iron as magnetite in its own tissues. Presumably it's a mutant from one of the regular iron-feeding strains. Judging by its general cellular conformation, its genetic tape is a purine-pyrimidine nucleotide quite similar to that of natural life—"

"Just another of the original artificial forms coming home to roost?" interjected Winkle.

"I suppose so. I've isolated some of the nuclear material, but it will have to go back to the big field analyzer on the *Guppy* to make sure."

"There seem to be no more damaged fish in the neighborhood. Is there any other material you need before we go back?"

"No. Might as well wind her up, as far as I'm concerned—unless it would be a good idea to call the ship first while we're out here to find out whether any other schools this way need checking."

"You can't carry any more specimens in your lab even if they do," Winkle pointed out, glancing around the littered bench tops.

"True enough. Maybe there's something which wouldn't need a major checkup, though. But you're the captain; play it as you think best. I'll be busy with this lot until we get back to the *Guppy* whether we go straight there or not."

"I'll call." The captain turned away to his own station.

"I wonder why they made the first pseudo-life machines with gene

tapes so much like the real thing," Stubbs remarked when Winkle was back in his seat. "You'd think they'd foresee what mutations could do, and that organisms too similar to genuine life might even give rise to forms which could cause disease in us as well as in other artificial forms."

"They thought of it, all right," replied Mancini. "That possibility was a favorite theme of the opponents of the whole process—at least, of the ones who weren't driven by frankly religious motives. Unfortunately, there was no other way the business could have developed. The original research of course had to be carried out on what you call 'real' life. That led to the specific knowledge that the cytosine-thymine-adenine-guanine foursome of ordinary DNA could form a pattern which was both self-replicating and able to control polypeptide and polysaccharide synthesis—"

"But I thought it was more complex than that; there are phosphates and sugars in the chain, and the DNA imprints RNA, and —"

"You're quite right, but I wasn't giving a chemistry lecture; I was trying to make an historical point. I'm saying that at first, no one realized that anything except those four specific bases could do the genetic job. Then they found that quite a lot of natural life forms had variations of those bases in their nucleotides, and gradually the reasons why those structures, or rather their

potential fields, had the polymer-molding ability they do became clear. Then, and only then, was it obvious that 'natural' genes aren't the only possible ones; they're simply the ones which got a head start on this planet. There are as many ways of building a gene as there are of writing a poem—or of making an airplane if you prefer to stay on the physical plane. As you seem to know, using the channels of a synthetic zeolite as the backbone for a genetic tape happens to be a very convenient technique when we want to grow a machine like the one we've just taken apart here. It's bulkier than the phosphate-sugar-base tape, but a good deal more stable.

"It's still handy, though, to know how to work with the real thing—after all, you know as well as I do that the reason you have a life expectancy of about a hundred and fifty years is that your particular gene pattern is on file in half a cubic meter of zeolite mesh in Denver under a nice file number . . ."

"026-18-5633" muttered the boy under his breath.

". . . which will let any halfway competent molecular mechanic like me grow replacement parts and tissues if and when you happen to need them."

"I know all that, but it still seems dangerous to poke around making little changes in ordinary life forms," replied Rick. "There must be fifty thousand people like you in the

world, who could tailor a dangerous virus, or germ, or crop fungus in a couple of weeks of lab and computer work, and whose regular activities produce things like that iron-feeder which can mutate into dangerous by-products."

"It's also dangerous to have seven billion people on the planet, practically every one of whom knows how to light a fire," replied Mancini. "Dangerous or not, it was no more possible to go from Watson and Crick and the DNA structure to this zeowhale without the intermediate development than it would have been to get from the Wright brothers and their powered kite to the two-hour transatlantic ramjet without building Ford tri-motors and DC-3's in between. We have the knowledge, it's an historical fact that no one can effectively destroy it, so we might as well use it. The fact that so many competent practitioners of the art exist is our best safeguard if it does get a little out of hand at times."

The boy looked thoughtful.

"Maybe you have something there," he said slowly. "But with all that knowledge, why only a hundred and fifty years? Why can't you keep people going indefinitely?"

"Do you think we should?" Mancini countered with a straight face. Rick grinned.

"Stop ducking. If you could, you would—for some people anyway. Why can't you?" Mancini shrugged.

“Several hundred million people undoubtedly know the rules of chess.” He nodded toward the board on Dandridge’s control table. “Why aren’t they all good players? You know, don’t you, why doctors were reluctant to use hormones as therapeutic agents even when they became available in quantity?”

“I think so. If you gave someone cortisone it might do what you wanted, but it might also set other glands going or slow them down, which would alter the levels of other hormones, which in turn . . . well, it was a sort of chain reaction which could end anywhere.”

“Precisely. And gene-juggling is the same only more so. If you were to sit at the edge of the hatch there and let Gil close it on you, I could rig the factors in your gene pattern so as to let you grow new legs; but there would be a distinct risk of affecting other things in your system at the same time. In effect, I would be taking certain *restraints* which caused your legs to stop growing when they were completed *off* your cell-dividing control mechanisms—the sort of thing that used to happen as a natural, random effect in cancer. I’d probably get away with it—or rather, you would—since you’re only about nineteen and still pretty deep in what we call the stability well. As you get older, though, with more and more factors interfering with that stability, the job gets harder—it’s a literal juggling act, with more and more balls being

tossed to the juggler every year you live.

“You were born with a deep enough stability reserve to keep yourself operating for a few decades without any applied biochemical knowledge; you might live twenty years or ninety. Using the knowledge we have, we can play the game longer; but sooner or later we drop the ball. It’s not that we don’t know the rules; to go back to the chess analogy, it’s just that there are too many pieces on the board to keep track of all at once.”

Stubbs shook his head. “I’ve never thought of it quite that way. To me, it’s always been just a repair job, and I couldn’t see why it should be so difficult.”

Mancini grinned. “Maybe your cultural grounding didn’t include a poem called the ‘Wonderful One-Hoss Shay.’ Well, we’ll be a couple of hours getting back to the *Guppy*. There are a couple of sets of analysis runs sitting with us here. Maybe, if I start trying to turn those into language you can follow, you’ll have some idea of why the game is so hard before we get there. Maybe, too”—his face sobered somewhat—“you’ll start to see why, even though we always lose in the end, the game is so much fun. It isn’t just that our own lives are at stake, you know; men have been playing that kind of game for two million years or so. Come on.”

He turned to the bench top on which the various analyzers had

been depositing their results; and since Stubbs had a good grounding in mathematical and chemical fundamentals, their language ceased to resemble Basic English. Neither paid any attention as the main driving turbines of the *Shark* came up to quarter speed and the vessel began to pick her way out of the patch of ice floes where the zeowhales had been collecting metal.

By the time Winkle had reached open water and Ishihara had given him the clearance for high cruise, the other four had lost all contact with the outside world. Dandridge's chess board was in use again, with Farrell now his opponent. The molecular mechanic and his possible apprentice were deeply buried in a task roughly equivalent to explaining to a forty-piece orchestra how to produce "Aida" from overture to finale—without the use of written music. Stubbs' basic math was, for this problem, equivalent to having learned just barely his "do, re, mi."

There was nothing to distract the players of either game. The wind had freshened somewhat, but the swells had increased little if at all. With the *Shark* riding on her hydrofoils there was only the faintest of tremors as her struts cut the waves. The sun was still high and the sky almost cloudless. Between visual pilotage and sonar, life seemed as uncomplicated as it ever gets for the operator of a high-speed vehicle.

The *Guppy* was nearly two hundred kilometers to the south, far beyond sonar range. Four of her other boats were out on business, and Winkle occasionally passed a word or two with their commanders; but no one had anything of real importance to say. The desultory conversations were a matter of habit, to make sure that everyone was still on the air. No pilot, whether of aircraft, space vessel, surface ship, or submarine, attaches any weight to the proverb that no news is good news.

Just who was to blame for the interruption of this idyll remains moot. Certainly Mancini had given the captain his preliminary ideas about the pest which had killed their first whale. Just as certainly he had failed to report the confirmation of that opinion after going through the lab results with Stubbs. Winkle himself made no request for such confirmation—there was no particular reason why he should, and if he had it is hard to believe that he would either have realized all the implications or been able to do anything about them. The fact remains that everyone from Winkle at the top of the ladder of command to Stubbs at the bottom was taken completely by surprise when the *Shark's* starboard after hydrofoil strut snapped cleanly off just below the mean planing water line.

At sixty-five knots, no human reflexes could have coped with the result. The electronic ones of the

Shark tried, but the vessel's mechanical I.Q. was not up to the task of allowing for the lost strut. As the gyros sensed the drop in the right rear quadrant of their field of perception, the autopilot issued commands to increase the angle of attack of the control foils on that strut. Naturally there was no response. The dip increased. By the time it got beyond the point where the machine thought it could be handled by a single set of foils, so that orders went out to decrease lift on the port-bow leg, it was much too late. The after portion of the starboard flotation hull smacked a wave top at sixty-five knots and, of course, bounced. The bounce was just in time to reinforce the let-down command to the port-bow control foils. The bow curve of the port hull struck in its turn, with almost undiminished speed and with two principal results.

About a third of the *Shark's* forward speed vanished in less than the same fraction of a second as she gave up kinetic energy to the water in front, raising a cloud of spray more than a hundred meters and subjecting hull and contents to about four gravities of acceleration in a most unusual direction. The rebound was high enough to cause the starboard "wing" to dip into the waves, and the *Shark* did a complete double cartwheel. For a moment she seemed to poise motionless with port wing and hull entirely submerged and the opposite wing

tip pointing at the sky; then, grudgingly, she settled back to a nearly horizontal position on her flotation hulls and lay rocking on the swell.

Externally she showed little sign of damage. The missing strut was, of course, under water anyway, and her main structure had taken only a few dents. The propellers had been twisted off by gyroscopic action during the cartwheel. Aside from this, the sleek form looked ready for service.

Inside, things were different. Most of the apparatus, and even some of the men, had been more or less firmly fixed in place; but the few exceptions had raised a good deal of mayhem.

Winkle and Ishihara were unconscious, though still buckled in their seats. Both had been snapped forward against their respective panels, and were draped with sundry unappetizing fragments of the dissected zeowhale. Ishihara's head had shattered the screen of his sonar instrument, and no one could have told at first glance how many cuts were supplying the blood on his face.

The chess players had both left impressions on the control panel of the winch and handling system, and now lay crumpled beside it. Neither was bleeding visibly, but Farrell's arms were both twisted at angles impossible to intact bones. Dandridge was moaning and just starting to try to get to his feet; he and Man-

cini were the only ones conscious.

The mechanic had been seated at one of his benches facing the starboard side of the ship when the impact came. He had not been strapped in his seat, and the four-G jerk had started to hurl him toward the bow. His right leg had stopped him almost as suddenly by getting entangled in the underpinning of the seat. The limb was not quite detached from its owner; oddly enough, its skin was intact. This was about the only bit of tissue below the knee for which this statement could be made.

Stubbs had been standing at the mechanic's side. They were to argue later whether it had been good or bad luck that the side in question had been the left. It depended largely on personal viewpoint. There had been nothing for Rick to seize as he was snatched toward the bow or, if there was, he had not been quick enough or strong enough to get it. He never knew just what hit him in flight; the motions of the *Shark* were so wild that it might have been deck, overhead, or the back of one of the pilot seats. It was evident enough that his path had intersected that of the big flask in which Mancini had first collected the iron-feeding tissue, but whether the flask was still whole at the time remains unclear. It is hard to see how he could have managed to absorb so many of its fragments had it already shattered, but it is equally hard to understand how he could

have scattered them so widely over his anatomy if it had been whole.

It was Stubbs, or rather the sight of him, that got Mancini moving. Getting his own shattered leg disentangled from the chair was a distracting task, but not distracting enough to let him take his eyes from the boy a few meters away. Arterial bleeding is a sight that tends to focus attention.

He felt sick, over and above the pain of his leg; whether it was the sight of Rick or incipient shock he couldn't tell. He did his best to ignore the leg as he inched across the deck, though the limb itself seemed to have other ideas. Unfortunately these weren't very consistent; sometimes it wanted—demanded—his whole mind, at others it seemed to have gone off somewhere on its own and hidden. He did not look back to see whether it was still with him; what was in front was more important.

The boy still had blood when Mancini reached him, as well as a functioning heart to pump it. He was not losing the fluid as fast as had appeared from a distance, but something would obviously have to be done about what was left of his right hand—the thumb and about half of the palm. The mechanic had been raised during one of the periods when first-aiders were taught to abjure the tourniquet, but had reached an age where judgment stands a chance against rules. He had a belt and used it.

A close look at the boy's other injuries showed that nothing could be done about them on the spot; they were bleeding slowly, but any sort of first aid would be complicated by the slivers of glass protruding from most of them. Face, chest, and even legs were slashed freely, but the rate of bleeding was not—Mancini hoped—really serious. The smaller ones were clotting already.

Dandridge was on his feet by now, badly bruised but apparently in the best shape of the six.

"What can I do, Marco?" he asked. "Everyone else is out cold. Should I use—"

"Don't use anything on them until we're sure there are no broken necks or backs; they may be better off unconscious. I know I would be."

"Isn't there dope in the first-aid kit? I could give you a shot of pain-killer."

"Not yet, anyway. Anything that would stop this leg from hurting would knock me out, and I've got to stay awake if at all possible until help comes. The lab equipment isn't really meant for repair work, but if anything needs to be improvised from it I'll have to be the one to do it. I could move around better, though, if this leg were splinted. Use the raft foam from the handling locker."

Five minutes later Mancini's leg, from mid-thigh down, was encased in a bulky, light, but reasonably

rigid block of foamed resin whose original purpose was to provide on-the-spot flotation for objects which were inconvenient or impossible to bring aboard. It still hurt, but he could move around without much fear of doing the limb further damage.

"Good. Now you'd better see what communication gear, if any, stood up under this bump. I'll do what I can for the others. Don't move Ishi or the captain; work around them until I've done what I can."

Dandridge went forward to the conning section and began to manipulate switches. He was not a trained radioman—the *Shark* didn't carry one—but like any competent crew member he could operate all the vessel's equipment under routine conditions. He found quickly that no receivers were working, but that the regular transmitter drew current when its switches were closed. An emergency low-frequency beacon, entirely separate from the other communication equipment, also seemed intact; so he set this operating and began to broadcast the plight of the *Shark* on the regular transmitter. He had no way of telling whether either signal was getting out, but was not particularly worried for himself. The *Shark* was theoretically unsinkable—enough of her volume was filled with resin foam to buoy her entire weight even in fresh water. The main question was whether

help would arrive before some of the injured men were beyond it.

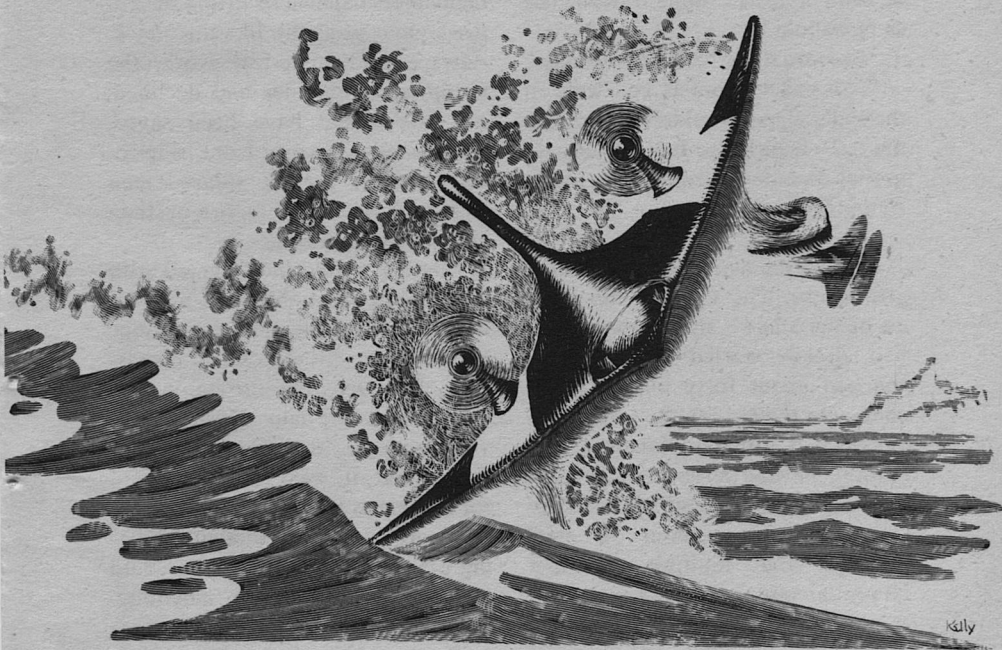
After ten minutes of steady broadcasting—he hoped—Dandridge turned back to the mechanic, to find him lying motionless on the deck. For a moment the winchman thought he might have lost consciousness; then Mancini spoke.

“I’ve done all I can for the time being. I’ve splinted Joe’s arms and pretty well stopped Rick’s bleeding. Ishi has a skull fracture and the captain at least a concussion; don’t move either one. If you’ve managed to get in touch with the *Guppy*, tell them about the injuries. We’ll need gene records from Denver for Rick,

probably for Ishi, and possibly for the captain. They should start making blood for Rick right away, the second enough gene data is through; he’s lost quite a bit.”

“I don’t know whether I’m getting out or not, but I’ll say it all anyway,” replied Dandridge, turning back to the board. “Won’t you need some pretty extensive repair work yourself, though?”

“Not unless these bone fragments do more nerve damage than I think they have,” replied Mancini. “Just tell them that I have a multiple leg fracture. If I know Bert Jellinge, he’ll have gene blocks on all six of us growing into the machines before



we get back to the *Guppy* anyway.”

Dandridge eyed him more closely. “Hadn’t I better give you a shot now?” he asked. “You said you’d done all you could, and it might be better to pass out from a sleepy shot than from pain. How about it?”

“Get that message out first. I can hold on, and what I’ve done is the flimsiest of patchwork. With the deck tossing as it is any of those splints may be inadequate. We can’t strap any of the fellows down, and if the wave motion rolls one of them over I’ll have the patching to do all over again. When you get that call off, look at Rick once more; I think his bleeding has stopped, but until he’s on a repair table I won’t be happy about him.”

“So you’d rather stay awake.”

“Not exactly, but if you were in the kid’s place, wouldn’t *you* prefer me to?” Dandridge had no answer to that one; he talked into the transmitter instead.

His words, as it happened, were getting out. The *Conger*, the nearest of the *Shark*’s sister fish-tenders, had already started toward them; she had about forty kilometers to come. On the *Guppy* the senior mechanic had fulfilled Mancini’s prediction; he had already made contract with Denver, and Rick Stubbs’ gene code was about to start through the multiple-redundant communication channels used for the purpose—channels which, fortunately, had just been freed of the

saturation caused by a serious explosion in Pittsburgh, which had left over five hundred people in need of major repair. The full transmission would take over an hour at the highest safe scanning rate; but the first ten minutes would give enough information, when combined with the basic human data already in the *Guppy*’s computers, to permit the synthesis of replacement blood.

The big mother-ship was heading toward the site of the accident so as to shorten the *Conger*’s journey with the victims. The operations center at Cape Farewell had offered a “mastodon”—one of the gigantic helicopters capable of lifting the entire weight of a ship like the *Shark*. After a little slide-rule work, the *Guppy*’s commander had declined; no time would have been saved, and the elimination of one ship-to-ship transfer for the injured men was probably less important than economy of minutes.

Mancini would have agreed with this, had he been able to join in the discussion. By the time Dandridge had finished his second transmission, however, the mechanic had fainted from the pain of his leg.

Objectively, the winchman supposed that it was probably good for his friend to be unconscious. He was not too happy, though, at being the only one aboard who could take responsibility for anything. The half hour it took for the *Conger* to arrive was not a restful one for

him, though it could not have been less eventful. Even sixty years later, when the story as his grandchildren heard it included complications like a North Atlantic winter gale, he was never able to paint an adequate word picture of his feelings during those thirty minutes—much less an exaggerated one.

The manta-like structure of the tenders made transshipping most practical from bow-to-bow contact, but it was practical at all only on a smooth sea. In the present case, the *Conger's* commander could not bring her bow closer than ten meters to that of the crippled ship, and both were pitching too heavily even for lines to be used.

One of the *Conger's* divers plunged into the water and swam to the helpless vessel. Dandridge saw him coming through the bow ports, went back to his console, and rather to his surprise found that the hatch and ladder responded to their control switches. Moments later the other man was on the deck beside him.

The diver took in the situation after ten seconds of explanation by Dandridge and two of direct examination, and spoke into the transmitter which was part of his equipment. A few seconds later a raft dropped from the *Conger's* hatch and two more men clambered down into it. One of these proved on arrival to be Mancini's opposite number, who wasted no time.

"Use the foam," he directed.

"Case them all up except for faces; that way we can get them to the bench without any more limb motion. You say Marco thought there might be skull or spine fractures?"

"He said Ishi had a fractured skull and Winkle might have. All he said about spines was that we'd have to be careful in case it had happened."

"Right. You relax; I'll take care of it." The newcomer took up the foam generator and went to work.

Twenty minutes later the *Conger* was on her hydroplanes once more, heading for rendezvous with the *Guppy*.

In spite of tradition, Rick Stubbs knew where he was when he opened his eyes. The catch was that he hadn't the faintest idea how he had gotten there. He could see that he was surrounded by blood-transfusion equipment, electronic circulatory and nervous system monitoring gear, and the needle-capillary-and-computer maze of a regeneration unit, though none of the stuff seemed to be in operation. He was willing to grant from all this that he had been hurt somehow; the fact that he was unable to move his head or his right arm supported this notion. He couldn't begin to guess, however, what sort of injury it might be or how it had happened.

He remembered talking and working with Mancini at the latter's lab bench. He could not recall for certain just what the last thing said

or done might be, though; somehow the picture merged with the foggy struggle back to consciousness which had culminated in recognition of his surroundings.

He could see no one near him, but this might be because his head wouldn't turn. Could he talk? Only one way to find out.

"Is anyone here? What's happened to me?" It didn't sound very much like his own voice, and the effort of speech hurt his chest and abdomen; but apparently words got out.

"We're all here, Rick. I thought you'd be switching back on about now." Mancini's face appeared in Stubbs' narrow field of vision.

"We're *all* here? Did everyone get hurt somehow? What happened?"

"Slight correction—most of us are here, one's been and gone. I'll tell you as much as I can; don't bother to ask questions, I know it must hurt you to talk. Gil was here for a while, but he just had a few bruises and is back on the job. The rest of us were banged up more thoroughly. My right leg was a jigsaw puzzle; Bert had an interesting time with it. I thought he ought to take it off and start over, but he stuck with it, so I got off with five hours of manual repair and two in regeneration instead of a couple of months hooked up to a computer. I'm still splinted, but that will be for only a few more days.

"No one knows yet just what happened. Apparently the *Shark* hit

something going at full clip, but no one knows yet what it was. They're towing her in; I trust there'll be enough evidence to tell us the whole story."

"How about the other fellows?"

"Ishi is plugged in. He may need a week with computer regeneration control, or ten times that. We won't be able to assess brain damage until we find how close to consciousness he can come. He had a bad skull fracture. The captain was knocked out, and some broken ribs I missed on the first-aid check did internal damage. Bert is still trying to get him off without regeneration, but I don't think he'll manage it."

"You didn't think he could manage it with you, either."

"True. Maybe it's just that I don't think I could do it myself, and hate to admit that Jellinge is better at my own job than I am."

"How about Joe?"

"Both arms broken and a lot of bruises. He'll be all right. That leaves you, young fellow. You're not exactly a critical case, but you are certainly going to call for professional competence. How fond are you of your fingerprints?"

"What? I don't track."

"Most of your right hand was sliced off, apparently by flying glass from my big culture flask. Ben Tully from the *Conger*, which picked us up, found the missing section and brought it back; it's in culture now."

"What has that to do with finger-

prints? Why didn't you or Mr. Jellinge graft it back?"

"Because there's a good deal of doubt about its condition. It was well over an hour after the accident before it got into culture. You know the sort of brain damage a few minutes without oxygen can do. I know the bone, tendon, and connective tissue in a limb is much less sensitive to that sort of damage, but an hour is a long time, chemically speaking. Grafting calls for healing powers which are nearly as dependent on genetic integrity as is nerve activity; we're just not sure whether grafting is the right thing to do in your case. It's a toss-up whether we should fasten the hand back on and work to make it take, or discard it and grow you a new one. That's why I asked how much you loved your fingerprints."

"Wouldn't a new hand have the same prints?"

"The same print classification, which is determined genetically, but not the same details, which are random."

"Which would take longer?"

"If the hand is in shape to take properly, grafting would be quicker—say a week. If it isn't, we might be six or eight times as long repairing secondary damage. That's longer than complete regeneration would take."

"When are you going to make up your minds?"

"Soon. I wondered whether you'd have a preference."

"How could I know which is better when you don't? Why ask me at all?"

"I had a reason—several, in fact. I'll tell you what they were after you've had two years of professional training in molecular mechanics, if you decide to come into the field. You still haven't told me which you prefer."

The boy looked up silently for a full minute. Actually, he spent very little of that time trying to make his mind up; he was wondering what Mancini's reasons might be. He gave up, flipped a mental coin, and said, "I think I'd prefer the original hand, if there's a real chance of getting it back and it won't keep me plugged in to these machines any longer than growing a new one would."

"All right, we'll try it that way. Of course, you'll be plugged in for quite a while anyway, so if we do have trouble with the hand it won't make so much difference with your time."

"What do you mean? What's wrong besides the hand?"

"You hadn't noticed that your head is clamped?"

"Well, yes; I knew I couldn't move it, but I can't feel anything wrong. What's happened there?"

"Your face stopped most of the rest of the flask, apparently."

"Then how can I be seeing at all, and how is it that I talk so easily?"

"If I knew that much about probability, I'd stop working for a living and take up professional gambling."

When I first saw you after your face had been cleaned off and before the glass had been taken out I wondered for a moment whether there hadn't been something planned about the arrangement of the slivers. It was unbelievable, but that's the way it happened. They say anything can happen once, but I'd advise you not to catch any more articles of glassware with your face."

"Just what was it like, Marco? Give me the details."

"Frankly, I'd rather not. There are record photos, of course, but if I have anything to say about it you won't see them until the rebuilding is done. Then you can look in a mirror to reassure yourself when the photos get your stomach. No"—as Stubbs tried to interrupt—"I respect what you probably think of as your clinical detachment, but I doubt very strongly that you could maintain it in the face of the real thing. I'm pretty sure that I couldn't, if it were my face." Mancini's thoughts flashed back to the long moments when he had been dragging his ruined leg across the *Shark's* deck toward the bleeding boy, and felt a momentary glow—maybe that disclaimer had been a little too modest. He stuck to his position, however.

Rick didn't argue too hard, for another thought had suddenly struck his mind. "You're using regeneration on my face, without asking me whether I want it the way you did with my hand. Right?"

"That's right," Mancini said.

"That means I'm so badly damaged that ordinary healing won't take care of it."

Mancini pursed his lips and thought carefully before answering. "You'd heal, all right," he admitted at last. "You might just possibly, considering your age, heal without too much scarring. I'd hesitate to bet on that, though, and the scars you could come up with would leave you quite a mess."

Stubbs lay silent for a time, staring at the featureless ceiling. The mechanic was sure his expression would have been thoughtful had enough of the young face been visible to make one. He could not, however, guess at what was bothering the boy. As far as Mancini could guess from their work together there was no question of personal cowardice—for that matter, the mechanic could not see what there might be to fear. His profession made him quite casual about growing tissue, natural or artificial, on human bodies or anywhere else. Stubbs was in no danger of permanent disfigurement, crippling damage, or even severe pain; but something was obviously bothering the kid.

"Marco," the question came finally, "just where does detailed genetic control end, in tissue growth, and statistical effects take over?"

"There's no way to answer that both exactly and generally. Genetic

factors are basically probability ones, but they're characterized by regions of high probability which we call stability wells. I told you about fingerprints, but each different situation would call for a different specific answer."

"It was what you said about prints that made me think of it. You're going to rebuild my face, you say. You won't tell me just how much rebuilding has to be done, but you admitted I *could* heal normally. If you rebuild, how closely will you match my original face? Does that statistical factor of yours take over somewhere along the line?"

"Statistical factors are everywhere, and work throughout the whole process," replied Mancini without in the least meaning to be evasive. "I told you that. By rights, your new face should match the old as closely as the faces of identical twins match each other, and for the same reason. I grant that someone who knows the twins really well can usually tell them apart, but no one will have your old face around for close comparison. No one will have any doubt that it's you, I promise."

"Unless something goes wrong."

"If it goes wrong enough to bother you, we can always do it over."

"But it *might* go really wrong."

Mancini, who would have admitted that the sun might not rise the next day if enough possible events all happened at once, did not deny this, though he was beginning to

feel irritated. "Does this mean that you don't want us to do the job? Just take your chances on the scars?" he asked.

"Why do scars form, anyway?" was the counter. "Why can't regular, normal genetic material reproduce the tissue it produced in the first place? It certainly does sometimes; why not always?"

"That's pretty hard to explain in words. It has to do with the factors which stopped your nose growing before it became an elephant's trunk—or more accurately, with the factors which stopped your overall growth where they did. I can describe them quite completely, and I believe quite accurately, but not in Basic English."

"Can you measure those factors in a particular case?"

"Hm-m-m, yes; fairly accurately, anyway." Stubbs pounced on this with an eagerness which should have told the mechanic something.

"Then can't you tell whether these injuries, in my particular case, will heal completely or leave scars?"

"I . . . well, I suppose so. Let's see; it would take . . . hm-m-m; I'll have to give it some thought. It's not regular technique. We usually just rebuild. What's your objection, anyway? All rebuilding really means is that we set things going and then watch the process, practically cell by cell, and correct what's happening if it isn't right—following the plans you used in the first place."

"I still don't see why my body

can't follow them without your help."

"Well, no analogy is perfect; but roughly speaking, it's because the cells which will have to divide to produce the replacement tissue had the blueprints which they used for the original construction stamped 'production complete; file in reference storage' some years ago, and the stamp marks covered some of the lines on the plans." Mancini's temper was getting a little short, as his tone showed. Theoretically his leg should not have been hurting him, but he had been standing on it longer than any repairman would have advised at its present stage of healing. And why did the kid keep beating around the bush?

Stubbs either didn't notice the tone or didn't care.

"But the plans—the information—that's still there; even I know that much molecular biology. I haven't learned how to use your analysis gear yet, much less to reduce the readings; but I can't see why you'd figure it much harder to read the plans under the 'file' stamp than to work out the ability of that magnetite slime to digest iron from the base configuration of a single cell's genes."

"Your question was why your body couldn't do it; don't change the rules in the middle of the game. I didn't say that *I* couldn't; I could. What I said was that it isn't usual, and I can't see what will be gained

by it; you'd at least double the work. I'm not exactly lazy, but the work at best is difficult, precise, and time-consuming. If someone were to paint your portrait and had asked you whether you wanted it on canvas or paper, would you dither along asking about the brand of paint and the sizes of brushes he was going to use?"

"I don't think that's a very good analogy. I just want to know what to expect—"

"You can't *know* what to expect. No one can. Ever. You have to play the odds. At the moment, the odds are so high in your favor that you'd almost be justified in saying that you know what's going to happen. All I'm asking is that you tell me straight whether or not you want Bert and me to ride control as your face heals, or let it go its own way."

"But if you can grow a vine that produces ham sandwiches instead of pumpkins, why—" Mancini made a gesture of impatience. He liked the youngster and still hoped to recruit him, but there are limits.

"Will you stop sounding like an anti-vivisectionist who's been asked for a statement on heart surgery and give me a straight answer to a straight question? The chances are all I can give you. They are much less than fifty-fifty that your face will come out of this without scars on its own. They are much better than a hundred to one that even your mother will never know there's been a controlled regeneration job

done on you unless you tell her. You're through general education, legally qualified to make decisions involving your own life and health, and morally obligated to make them instead of lying there dithering. Let's have an answer."

For fully two minutes, he did not get it. Rick lay still, his expression hidden in dressings, eyes refusing to meet those of the man who stood by the repair table. Finally, however, he gave in.

"All right, do your best. How long did you say it would take?"

"I don't remember saying, but probably about two weeks for your face. You'll be able to enjoy using a mirror long before we get that hand unplugged, unless we're remarkably lucky with the graft."

"When will you start?"

"As soon as I've had some sleep. Your blood is back to normal, your general pattern is in the machine; there's nothing else to hold us up. What sort of books do you like?"

"Huh?"

"That head's going to be in a clamp for quite a while. You may or may not like reading, but the only direction you can look comfortably is straight up. Your left hand can work a remote control, and the tape reader can project on the ceiling. I can't think of anything else to occupy you. Do you want some refreshing light fiction, or shall I start you on Volume One of 'Garwood's Elementary Matrix Algebra for Biochemists?'"

A regeneration controller is a bulky machine, even though most of it has the delicacy and structural intricacy possible only to pseudolife—and, of course, to "real" life. Its sensors are smaller in diameter than human red blood cells, and there are literally millions of them. Injectors and samplers are only enough larger to take entire cells into their tubes, and these also exist in numbers which would make the device a hopeless one to construct mechanically. Its computer-controller occupies more than two cubic meters of molecular-scale "machinery" based on a synthetic zeolite framework. Mating the individual gene record needed for a particular job to the basic computer itself takes nearly a day; it would take a lifetime if the job had to be done manually, instead of persuading the two to "grow" together.

Closing the gap between the optical microscope and the test tube, which was blanketed under the word "protoplasm" for so many decades, also blurred the boundary between such initially different fields as medicine and factory design. Marco Mancini and Bert Jellinge regarded themselves as mechanics; what they would have been called a few decades earlier is hard to say. Even at the time the two had been born, no ten Ph. D.'s could have supplied the information which now formed the grounding of their professional practice.

When their preliminary work—the

“prepping”—on Rick Stubbs was done, some five million sensing tendrils formed a beard on the boy’s face, most of them entering the skin near the edges of the injured portions. Every five hundred or so of these formed a unit with a pair of larger tubes. The sensors kept the computer informed of the genetic patterns actually active from moment to moment in the healing tissue—or at least, a statistically significant number of them. Whenever that activity failed to match within narrow limits what the computer thought should be happening, one of the larger tubes ingested a single cell from the area in question and transferred it to a large incubator—“large” in the sense that it could be seen without a microscope—just outside Rick’s skin. There the cell was cultured through five divisions, and some of the product cells analyzed more completely than they could be inside a human body. If all were well after all, which was quite possible because of the limitations of the small sensors, nothing more happened.

If things were really not going according to plan, however, others of the new cells were modified. Active parts of their genetic material which should have been inert were inerted, quiet parts which should have been active were activated. The repaired cells were cultivated for several more divisions; if they bred true, one or more of them was returned to the original site—or at least, to

within a few microns of it. Cell division and tissue building went on according to the modified plan until some new discrepancy was detected.

Most of this was, of course, automatic; too many millions of operations were going on simultaneously for detailed manual control. Nevertheless, Mancini and Jellinge were busy. Neither life nor pseudolife is infallible; mutations occur even in triply-redundant records. Computation errors occur even—or especially—in digital machines which must by their nature work by successive-approximation methods. It is much better to have a human operator, who knows his business, actually see that connective tissue instead of epidermis is being grown in one spot, or nerve instead of muscle cells in another.

Hence, a random selection of cells, not only from areas which had aroused the computer’s interest but from those where all was presumably going well, also traveled out through the tubes. These went farther than just to the incubators; they came out to a point where gross microscopic study of them by a human observer was possible. This went on twenty-four hours a day, the two mechanics chiefly concerned and four others of their profession taking two-hour shifts at the microscope. The number of man-hours involved in treating major bodily injury had gone up several orders of magnitude since the time

when a sick man could get away with a bill for ten dollars from his doctor, plus possibly another for fifty from his undertaker.

The tendrils and tubes farthest from the damaged tissue were constantly withdrawing, groping their way to the action front, and implanting themselves anew, guided by the same chemical clues which brought leukocytes to the same area. Early versions of the technique had involved complex methods of warding off or removing the crowd of white cells from the neighborhood; the present idea was to let them alone. They were good scavengers, and the controller could easily allow for the occasional one which was taken in by the samplers.

So, as days crawled by, skin and fat and muscle and blood vessels, nerves and bones and tendons, gradually extended into their proper places in Stubbs' face and hand. The face, as Mancini had predicted, was done first; the severed hand had deteriorated so that most of its cells needed replacement, though it served as a useful guide.

With his head out of the clamp, the boy fulfilled another of the mechanic's implied predictions. He asked for a mirror. The man had it waiting, and produced it with a grin; but the grin faded as he watched the boy turn his face this way and that, checking his appearance from every possible angle. He would have expected a girl to act

that way; but why should this youngster?

"Are you still the same fellow?" Mancini asked finally. "At least, you've kept your fingerprints." Rick put the mirror down.

"Maybe I should have taken a new hand," he said. "With new prints I might have gotten away with a bank robbery, and cut short the time leading to my well-earned retired leisure."

"Don't you believe it," returned Mancini grimly. "Your new prints would be on file along with your gene record and retinal pattern back in Denver before I could legally have unplugged you from the machine. I had to submit a written summary of this operation before I could start, even as it was. Forget about losing your legal identity and taking up crime."

Stubbs shrugged. "I'm not really disappointed. How much longer before I can write a letter with this hand, though?"

"About ten days; but why bother with a letter? You can talk to anyone you want; haven't your parents been on the 'visor every day?"

"Yes. Say, did you ever find out what made the *Shark* pile up?"

Mancini grimaced. "We did indeed. She got infected by the same growth that killed the zeowhale we first picked up. Did you by any chance run that fish into any part of the hull while you were attaching the sling?"

Rick stared aghast. "My gosh!

Yes, I did. I held it against one of the side hulls because it was so slippery . . . I'm sorry . . . I didn't know—"

"Relax. Of course you didn't. Neither did I, then; and I never thought of the possibility later. One of the struts was weakened enough to fall at high cruise, though, and Newton's Laws did the rest."

"But does that mean that the other ships are in danger? How about the *Guppy* here? Can anything be done?"

"Oh, sure. It was done long ago. A virus for that growth was designed within a few weeks of its original escape; its gene structure is on file. The mutation is enough like the original to be susceptible to the virus. We've made up a supply of it, and will be sowing it around the area for the next few weeks wherever one of the tenders goes. But why change the subject, young fellow? Your folks *have* been phoning, because I couldn't help hearing their talk when I was on watch. Why all this burning need to write letters? I begin to smell the proverbial rat."

He noticed with professional approval that the blush on Rick's face was quite uniform; evidently a good job had been done on the capillaries and their auxiliary nerves and muscles. "Give, son!"

"It's . . . it's not important," muttered the boy.

"Not important . . . oh, I see. Not important enough to turn you

into a dithering nincompoop at the possibility of having your handsome features changed slightly, or make you drop back to second-grade level when it came to the responsibility for making a simple decision. I see. Well, it doesn't matter; she'll probably do all the deciding for you."

The blush burned deeper. "All right, Marco, don't sound like an ascetic; I know you aren't. Just do your job and get this hand fixed so I can write—at least there's still one form of communication you won't be unable to avoid overhearing while you're on watch."

"What a sentence! Are you sure you really finished school? But it's all right, Rick—the hand will be back in service soon, and it shouldn't take you many weeks to learn to write with it again—"

"What?"

"It is a new set of nerves, remember. They're connected with the old ones higher up in your hand and arm, but even with the old hand as a guide they probably won't go to exactly the same places to make contact with touch transducers and the like. Things will feel different, and you'll have to learn to use a pen all over again." The boy stared at him in dismay. "But don't worry. I'll do my best, which is very good, and it will only be a few more weeks. One thing, though—don't call your letter-writing problem my business; I'm just a mechanic. If you're really in love, you'd better get in touch with a doctor." ■

A Matter of Reality

*... Or as the patient said to the psychiatrist:
"Doctor, I'll 'face reality'
as soon as you can define exactly what it is!"*

CAROLE E. SCOTT



Leo Summers

Homer slowly inched the bedroom door open and peered down the hall. He could not see his daughter-in-law, but he could hear her footsteps as she moved about in the kitchen.

Satisfied, he stepped out into the hall and stealthily made his way toward the basement door. He had taken only a few steps when the shotgun slipped off his arm. With a swiftness he hadn't realized he still had, he grabbed for it, catching it just before it hit the floor.

The heady moment of strength passed almost instantly to be replaced by a trembling weakness. He held his breath and listened, his hands shaking spasmodically. He could hear no change in the sounds from the kitchen, but then he could hardly hear anything over the trip-hammer throbbing in his ears.

Breathing heavily, he sagged against the basement door. He wondered if he would be able to make it down the long, steep flight of steps. The throbbing in his ears gradually subsided, and, hesitantly, he turned the doorknob and carefully opened the door. He stepped quickly into the darkness. Gently shutting the door behind himself, he fumbled for the light switch. His groping fingers brushed against its smooth, plastic plate, and, with a snap, one that seemed alarmingly loud in the large, barren room, he flicked the switch on. Leaning ponderously on the creaking handrail, he stiffly crept down the steps.

"What was it Shakespeare said

about the seventh age of man?" he asked himself, his brow wrinkling in concentration.

"It starts out," he murmured, "All the world is a stage
And all the men and women merely players
With their exits and entrances;
And one man in his time plays
many parts . . ."

"Why can't I remember the rest?" he reviled himself angrily. "Why is my mind just a confused jumble of crumbling miscellany?"

Then he smiled sardonically, "It's because I am in the
'... Last scene of all,
That ends this strange
Eventful history,
In second childness and mere
oblivion,
Sans teeth, sans eyes, sans taste,
sans everything.'"

He had reached the bottom of the steps. He painfully lowered himself to a sitting position on the bottom step, not letting go of the railing until he was safely seated.

"Second childhood," he exclaimed. "Billy, eat your peas. And, Father Peterson, you know the doctor said you should eat that."

"To them I'm just a child who insists on adult privileges!"

Convulsively, he broke open the shotgun.

"Of course, I can't blame them. They have to wait on me hand and foot."

Looking down, his eyes, against his will, were drawn to the two

yawning caverns of black. For a moment he stared at them; then he put his hand over them. He looked intently at the hand. He studied it, noting each splotch of brown pigment, each wrinkle, each hair. As he would a road map, he followed each thick, blue vein until it disappeared.

Was he really this tired old man with a black, malignant thing hungrily growing inside him? It didn't seem possible. This just couldn't be. He was the boy who had thought nothing of plowing all day and dancing all night; the man who had always been ready to roughhouse with children, even after a hard day out in the field, and he was the engineer who had been considered so brilliant by his fellows.

This wreck of a body couldn't be his, but it was. He felt detached—in the manner of a theatergoer from a play—but he knew only too well he shared his body's infirmities.

He reached into his pocket and brought out a shell and dropped it into the left barrel. It glided in, stopping with a soft click. He reached for another shell, but changed his mind just as his fingers touched it.

"Another one would be entirely unnecessary," he told himself, his lips compressed in a tight smile.

He carefully placed the shotgun between his knees and methodically positioned it so that it pointed squarely at his chest. He leaned forward slightly until the barrel pressed into him solidly. He reluctantly let go of the barrel, letting both hands

fall limply to his sides. He sat there a moment as though immobilized. His hand inched toward the trigger. His thumb touched the cold metal. He jerked it away as though from an electric shock.

Resolutely, he put his thumb back on the trigger. His thumb tensed.

Thunderous applause assaulted his ears. He stiffened spasmodically, the shotgun slipping unnoticed down his body. Before his amazed eyes the far wall of the basement began dissolving.

"What!" he exclaimed incredulously.

Seemingly from out of nowhere, a thin, young man stepped in front of Homer. He bowed gracefully to the large, wildly enthusiastic crowd which was rapidly becoming visible behind the mist which had, only moments before, been a solid, brick wall.

A sparkling, iridescent curtain swirled across the basement, separating Homer and the smiling, young stranger from the bravoing crowd.

The stranger turned toward him, joyfully throwing out his arms, and said, "That quote from Shakespeare was the final, master touch. And to think that it was a last-minute inspiration on both our parts."

He roughly jerked Homer to his feet. "You're undoubtedly the best character I've ever had!"

The applause was growing to deafening proportions and, in answer, the curtain was opening again.

Dragging Homer with him, the stranger stepped forward to accept the crowd's acclamation. He bowed slightly several times, and indicated to Homer that he should do likewise. Homer, however, stood as though he had been turned to stone.

As the curtain closed, the young man waved jubilantly to the crowd before turning to extract Homer from its folds. The crowd roared with laughter.

A tall woman dazzlingly bedecked in jewels immediately rushed up to them. "That was simply marvelous, Andre," she gushed.

Several men and women soon joined her in heartily congratulating the young man. "This will become a classic, Andre!" one enthused. "Living drama has reached its zenith with this play."

Dragging Homer along in their wake, they slowly made their way toward a new door in the basement. Before they got there, however, a number of men in work clothes began pouring through this door. These men quickly and efficiently began dismantling the basement, revealing bare walls of dirty, pastel green. Homer looked on in stupefaction.

The two tides of people met and milled around a moment before Homer's group succeeded in getting through the door. As he passed them, the workmen vigorously slapped Andre's back. He grinned his thanks.

Looking very dazed, Homer kept trying to ask someone what was going on, but he was brushed aside, not angrily, but annoyedly.

They first took Homer through a room crammed with equipment whose nature he could not even guess at. His only clue to its purpose was a sign he saw on the door, "Thought Pickup and Projection."

They passed through several more rooms before reaching one in which a party seemed to be in progress. A loud cheer went up as they entered the room. Homer quickly became a center of attention. They pelted him with questions about what he thought or felt when so and so happened. Homer was soon floundering in a sea of words.

"Shut up!" he shouted, his hands over his ears. And, for a moment, there was silence. Then, only now in angry tones, the questions began again.

"They're drunk," one man apologized.

"I don't care!" Homer snapped back.

He was relieved when Andre shouldered his way through the crowd and asked them to leave him alone with Homer.

"Guess I'd better fill you in, old boy," he said after the others had retreated to a table piled high with food.

"First, you're the character in my play 'The Sunset Years.' Everything you've known up to now was

largely imaginary—people, places, events. Second, by the grace of the new law, you are now a free agent and entitled to a share of the profits made from reruns, which, I might add, won't be a paltry sum. Any questions?"

"I don't remember anything about being an actor!"

Andre chuckled, "Of course not, this is living drama. The fact that the character doesn't know it isn't real is the whole point.

"A living drama playwright invents a situation and a character to be put in it. The laboratory boys then whip up the character to the playwright's specifications. Although he may be an adult, the character's mind is almost blank until they artificially impress 'memories' on it.

"The playwright then puts the character in the situation. His reactions to it are the play."

"You mean my entire life has just been a play?" Homer cried.

"Yes, but your 'life' has only lasted," Andre said, glancing at his watch, "about two and one half hours so far."

"The rest of my life is just a 'memory' of something that never happened?" Homer asked. "None of it was real? My wife, my children, everything?"

"Yes. Well, almost everything. Making up a complete world, even just the part one person would be familiar with, is a big order, so I borrowed quite liberally from the real world. And then, too, the audi-

ence can identify with the character better that way.

"Of course, your play was a period piece, and that nullifies some of that identification. But so many people are fond of the good old days, and you've got to give them what they want." He gave Homer a conspiratorial grin.

"You know, it would have been absolutely perfect if you had only remembered that story I planted in your mind, the one about the man who was convinced that he was the only person in the world. He thought that everyone else only existed in his imagination," Andre said.

Homer buried his face in his hands. "Am I a robot?" he sobbed.

"I've already told you that I have no control over your actions," Andre replied in an exasperated manner. "Just because you're a test tube man doesn't mean I can control you like a machine, although that might not be a bad idea."

Andre moved away. However, he turned back once more to tell Homer, "Don't worry about living to enjoy your new wealth. We can de-age you almost as well as we can age you. You'll lose about twenty years, but you'll be a youth with the knowledge of an old man."

Homer sank into a chair. The party went on and on. After a few more tries at questioning him, they left Homer alone. After what seemed a long time to Homer, the party began to break up.

Andre threw himself into a chair next to Homer. He sighed deeply and unbuttoned his collar. "You could have been a little more cooperative, old pal," he told Homer. "But at that, you were better than most. One guy not only wouldn't talk, he went berserk and tried to take the place apart.

"You know, I can still hear him shouting, 'Go away, go away, you're not real!'"

Homer straightened his hunched shoulders and smiled strangely. "You know, I've been thinking. Your play could have been much more clever."

"How?" Andre demanded.

"Well, think how clever it would have been if you had made me a playwright who thought he was writing living dramas."

"Sort of a mirror in a mirror effect," Andre said. "Not bad."

"I'm glad you think so, because—" Homer said and gestured toward the remaining revelers.

As though quick-frozen, the revelers—some caught in mid step; others caught in mid sentence—stood for a moment before fading away.

Andre's mouth dropped open. For several seconds he remained oblivious to Homer's tugging at his arm. Finally noticing it, he turned around.

Behind him the wall was dissolving, revealing a vast sea of upturned faces. And as it dissolved the sound of applause grew and grew. Then,

seemingly from out of nowhere, a man appeared.

"Paul!" he called.

As though uncertain he was being addressed, the man known to Andre as Homer hesitated a moment before rising.

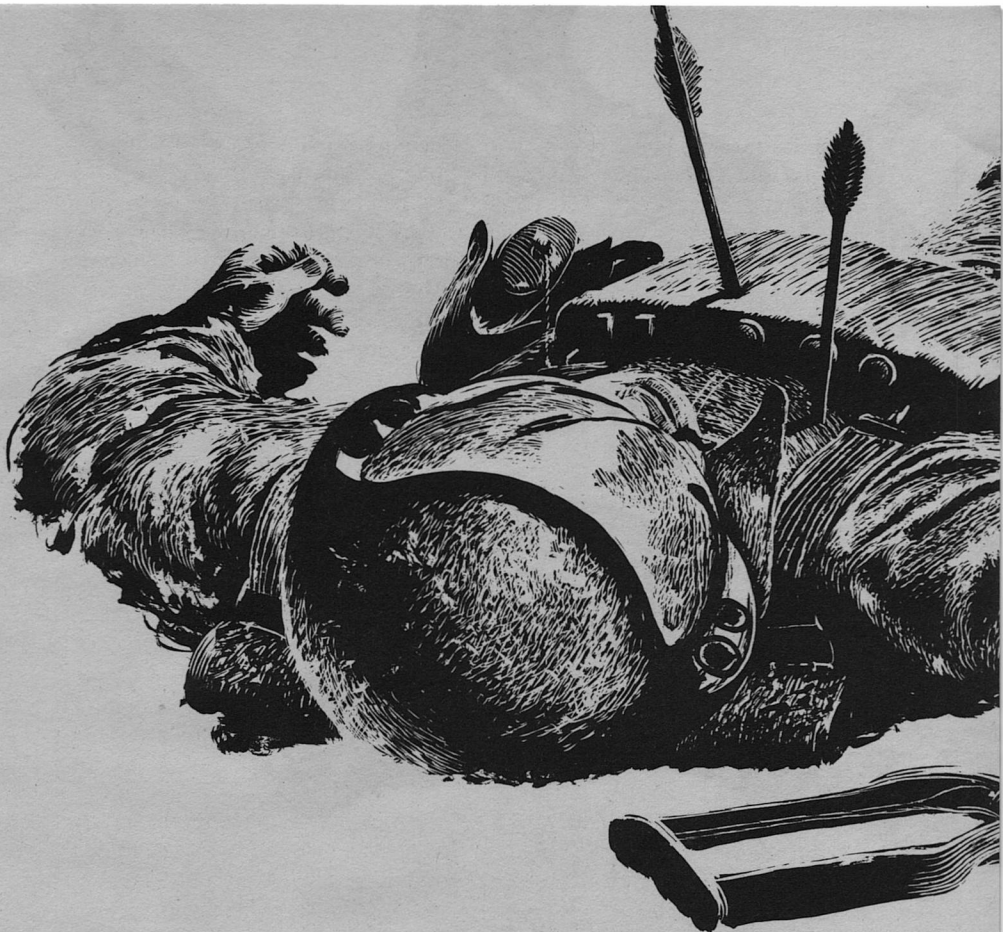
"That was magnificent, Paul. I've never seen a finer performance. And it was certainly a demanding role. You had to act right down to your very thoughts. That's acting!"

"A play like this would make any actor look good, Raymond. Let me be the first to congratulate you."

Together they accepted the audience's applause. The curtain closed only to be opened again and again. After making several appearances, Paul shook hands with the playwright, Raymond, and retired to the wings.

From his vantage point in the wings he watched as Raymond, squinting in the bright light and smiling broadly, waved to the crowd. Behind him sat poor Andre, looking like a man struggling for breath. He purposely avoided watching Andre, however, for he found watching Andre strangely disturbing. So he kept his eyes fixed on Raymond and the ebullient, wildly applauding audience. But as he looked he wondered.

He tried to shake off the uneasy feeling he had, but he couldn't. And as he turned his back on them all, the realization came to him that he'd never be able to shake it off. ■

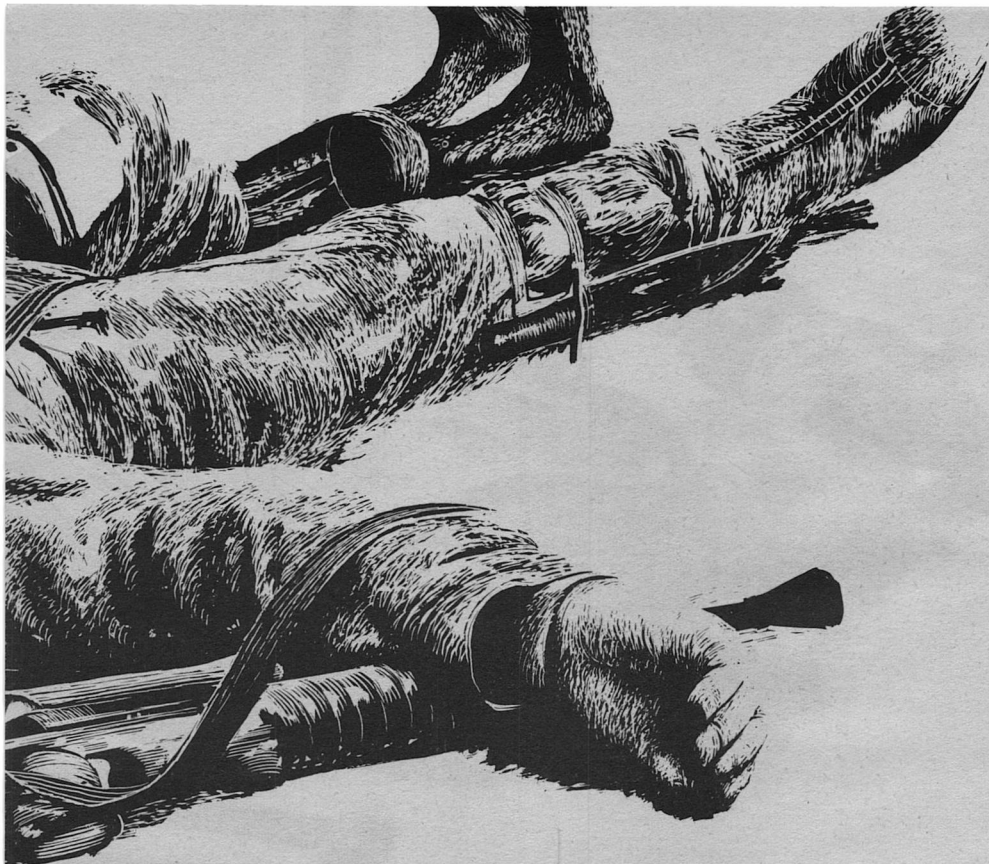


... not a prison make

*If the local natives of the planet
are culturally primitive, natural born teleports,
and dedicated to stealing your weapons—and using them on you—
what can you do about it?*

BY JOSEPH P. MARTINO

Illustrated by John Schoenherr



GUERRILLA WARFARE: An obsolete form of warfare practiced intermittently throughout history until the XX Century. It was characterized by conflict between professional soldiers formally organized into regular armies, on the one side, and nonprofessional, informally organized forces on the other side. As such, it could not exist except when warfare was customarily conducted by professional armies. Its most recent appearance was during the XVIIth through the XXth Centu-

ries. Its name, in fact, originated during that period, and means "little war" in the Spanish language—a Latin-based language formerly spoken in southeastern Europe; (see SPAIN).

It was widely practiced during the anti-colonial wars of the middle XXth Century, and received intensive theoretical and practical study by adherents of Communism (which

see). This emphasis on guerrilla warfare led to a reaction on the part of the forces against which it was being used, among which were most of the industrially and technologically advanced nations of the world. The apparent paradox of poorly-trained and ill-equipped irregulars being able to defeat well-trained and well-equipped regular troops sparked an intensive program of research among these advanced nations.

The inevitable result was the development of surveillance, mobility and communication techniques which gave the regular soldier of an advanced nation considerable advantage over his guerrilla opponent.

The guerrilla, of course, could not adopt these techniques, since they required an industrial base to supply them, an organized logistics system to maintain them, and highly trained personnel to operate them. The guerrilla could not survive against an opponent who was invulnerable to surprise, and who could move over any terrain faster than the guerrilla could move. Thus after the XXth Century, only a professional army could stand against another one. This in turn led to an accelerated spiral of measure and

countermeasure . . . From the *Terran Encyclopedia*, 37th Edition.

KREG WAR: One of the interstellar wars fought by the First Terran Confederation during its early period of expansion. It was named for the Kregs, a chlorine-breathing race occupying several solar systems in the vicinity of Polaris. The war climaxed a series of disputes over possession of a number of mineral-rich but airless minor planets in the region between the Terran and Kreg spheres of influence. After a number of raids and counter-raids on mining settlements, a major attack . . . The war was ended by the Treaty of Polaris, which granted to each side those planets already occupied, and provided an arbitration procedure to determine ownership of those unoccupied.

An interesting sidelight of the war was the resulting relationship between Terrans and the Kanthu, a humanoid race of oxygen-breathers. Their home planet, Kanth, occupied

a strategic position outflanking several of the Kregs' advanced bases. A Terran task force landed there and set up a base which was intended to serve as a staging point for attacks against the Kregs' inner defenses. The initial policy of noninterference with the Kanthu turned out to be impossible, and . . . From the *Terran Encyclopedia*, 41st Edition.

Private Chalut Wongsuwan was growing bored. The Task Force had hit dirt three weeks ago, and at first there was plenty to keep everyone busy. The first hastily-constructed defenses had been strengthened by round-the-clock work, in anticipation of the expected Kreg counter-attack. However, no attack had come. Surely the Kregs knew the Task Force was there. What was delaying them? What were they up to? But after three weeks, even these questions lost their power to keep anyone alert. Private Chalut Wongsuwan, being an experienced combat soldier, recognized the symptoms of boredom, and knew that when on sentry duty was a poor time to get bored. He got up from the rock on which he was sitting, and reviewed his sector.

He was responsible for an area which was a rough square, one kilometer on edge, and the first one hundred meters of airspace above it. This area had been saturated with detectors of all kinds, which noticed anything out of the ordinary going on around them. The first few nights

after landing, of course, had been spent finding out what was ordinary. The scents, sounds, electromagnetic radiations, seismic vibrations, and so on associated with the normal physical and animal activity of the area had been cataloged.

Now the ultrasonic pickups no longer reported the cries of an insectivorous batlike creature, but made a report only when the number of cries per minute deviated by more than a calculated percentage from what had been found to be the normal value for that time and place. The scent pickups no longer reported the mating odor of the females of a species of hard-shelled, ten-legged pseudo-beetles. The infra-red pickups no longer reported the intense emission from a small insect which, had its emission been visible, could have been called a firefly. And so on with all the other phenomena of the night in the forest.

The cataloging was not perfect yet, of course. There hadn't been time for that. Even back on Terra the detectors still pulled a few surprises now and then, and they had had centuries of refinement in the Terran environment. So several times during each watch the situation display, which portrayed the reports of all the sensors in the area in multicolored coded lights on the inside of the transparent face shield hanging from Private Chalut Wongsuwan's helmet, signaled a warning which turned out to be a false alarm when investigated.

Private Chalat Wongsuwan's boredom ended when an alarm signal appeared at a point near the center of the eastern edge of his area. He checked first with the sentry in the sector to the east.

"Ruongwit, this is Chalat. I've got a bogey at coordinates X—3917, Y—4231. Have you had anything heading my way?"

"Chalat, this is Ruongwit. Not a thing out of the ordinary in my sector. There hasn't been an alarm over your way all night, although I did have a couple on the other side earlier. When I got there, I couldn't find a thing wrong. The alarms had ceased, and everything was O.K. by then."

"Looks like the technicians are going to have to redefine what's normal for the area again. I'd better have a look anyway. Over and out."

There was still the possibility that something might have dropped out of the sky. He should have been informed by the Sergeant of the Guard if anything had been reported by the aerial patrol, or even the off-planet patrol, but slipups did happen from time to time.

"Sergeant of the Guard, this is Private Chalat."

"Go ahead, Chalat."

"I've got a bogey which just appeared in my sector. It didn't come from the next sector. Any reports of activity upstairs?"

"No reports of anything. What kind of an alarm do you have?"

"It just about covers the spectrum. Scent, infrared indicating a temperature near 40° Centigrade, sounds that could pass for breathing, the whole works. Only no footfalls from the seismic detectors. Wait a minute. The alarm just switched locations. The first spot is back to normal except for a reduced count on bird calls, as though the birds hadn't got over being scared. The alarm is now at a point halfway between me and the first point—exactly the same set of indications. I'd better take a look at both spots."

"Give me a report on anything, especially if it moves again."

"Roger, over and out."

He switched on his personal lifter, and reached treetop level. He drifted in the general direction of the alarm, threading his way through the treetops, getting as much concealment from them as he could without getting too close to them. His face mask display included a purple dot which was supposed to indicate his location, but he really didn't need it. The display also showed the swath of disturbance he was cutting through the night, as the many sensors reported his passage within their detection range. They couldn't be set to consider him as a normal part of the environment, without running the risk of failing to detect other humans who shouldn't be there. He reflected that, if there were any natives around who knew their way in these woods, they would have no trouble detecting him by the

change in the behavior of the animal and bird life. The purpose of his multitude of sensors was to give him the equivalent of a lifetime's experience in the environment, without taking a lifetime to acquire it, and to give him more detection range than his organic sensors possessed.

The alarm was coming from a small clearing ahead of him. He hung behind a screen of branches, looked over the clearing. There was what appeared to be a man standing in the middle of it. Just before he could call the Sergeant of the Guard, the man disappeared. Had he really seen anything, or was his gear playing tricks on him? Now there appeared to be two men at opposite edges of the clearing. There was another. No, one of the two had disappeared. He ought to make a report, but what would make sense?

He switched the lifter to a high-speed attack mode, and charged down at one of the figures. The figure disappeared. He halted and altered course toward the other figure, which also disappeared. He turned around. Both were behind him, on the other side of the clearing. He drifted toward the center of the clearing, gaining altitude. A microphone near the two figures picked up the twang of bowstrings, but by the time he could interpret the sound, two crossbow bolts had struck him. As he lost consciousness, the lifter lowered him to the ground to await medical pickup.

"Sergeant of the Guard. I've got a 'man down' signal on Chalat. He's badly wounded. No, there's a change. He's dead."

"Where is he?"

"Coordinates X—3820, Y—4417."

"Squad One, head directly for Chalat's position. Squads Two through Five, seal off the borders of his sector. Squads Six and Seven start combing the sector." Then, switching channels, "Aerial patrol, give me a tight roof over Sector 82. There's at least one hostile in it."

At this point the Officer of the Guard arrived. "Good response so far, Sergeant, but you'd better call up two or three reserve squads. We don't have enough left on duty to handle a similar attack on another sector. And warn all other sentries about what happened. I wish Chalat had given us more details as he went along."

"Sergeant of the Guard. Call from Ruongwit, in the sector next to Chalat's."

"I'll take it. Put him on."

"Sergeant, this is Ruongwit. I've got a bunch of bogeys just like the ones Chalat described. They keep jumping around. There are about a dozen of them, as near as I can tell. They won't hold still long enough to count. Now they seem to be clustering about my position."

"Get some altitude and get out of there. Shoot at anything you see. Acknowledge, Ruongwit."

"Sergeant, I can't raise him. Now

there's a 'man down' signal on him. He's dead, too."

"Sergeant, double the guard in all sectors. Call up all reserve squads. Call off the search in Sector 82. The next sector that reports some bogeys is to be saturated with all available forces."

"Yes, sir. Shall I sound a General Alert?"

"Better do that. The Kregs've clearly found some counter for our detectors. They may hit the Base next."

The Task Force Commander was distinctly unhappy, as any man who has been awakened at four in the morning to be told he's under attack has a right to be. "Well, Major Sakul, you were Officer of the Guard. Let's hear what happened."

"Yes, sir. Well, the first thing was Private Chalot. He was investigating a bogey that seemed to have jumped from one place to another. When we found him, he had two crossbow bolts in him, and his throat had been cut. In addition, he'd been stripped of all his loose equipment. Fortunately his recorders were still on him, so we could reconstruct what had happened. Forces had just been ordered out to comb his sector when the attackers struck the next sector. Same thing there. Ruongwit was found with three crossbow bolts in him. He must have been dead when he hit the ground, since his throat was still intact. He, too, was stripped of all his loose equipment.

"After that, bedlam broke loose. Every sector reported bogeys all over the place, all the same kind. They jumped from one place to another without seeming to be any place in between. We lost a total of eighteen guards, out of the one hundred twenty we had out. In all cases, they were stripped of their equipment. Those that weren't dead when they hit the ground had their throats cut. Next they started appearing inside the Base. They didn't seem to do any attacking there, they would just be reported somewhere, and then vanish. There were a few attempts to shoot at them, but no one hit them.

"I figured that we would do more damage to ourselves firing inside the Base than they seemed to be doing, so I ordered a halt to the firing within the boundary. After about thirty minutes the appearances seemed to peter out. There were a few reports for as long as an hour after the attack on Private Chalot, but I think they were all false alarms. I feel that the attackers first hit our guards, then penetrated the Base for reconnaissance purposes, and withdrew in order after they had what they came for. All in all, it looks like a well-coordinated attack, and if they decide to pull another one, I think they'll get away with it, too."

"Colonel Bunyarit."

The Executive Officer replied "Yes, sir."

"What have you to report?"

"Well, our first reaction, naturally, was that the Kregs had come up with something new. Somehow they had managed to drop landing parties near our Base, without their ships being detected on the way in, and then the landing parties had managed to spoof and jam our detectors so we couldn't keep up with them."

"And it wasn't the Kregs?"

The Executive Officer replied slowly. "No, sir. When Chalat attacked one of the intruders, his action recorder went on. We got a good look at the one he went after. Then we saw the figure of the intruder disappear. The same thing happened to the next one he went after. He turned and spotted some more. However, they were the same two he started after. Despite the fact that both moons were down, there was enough starlight for the image intensifier to give us a good picture. We could identify the marking on the loincloths of the two figures, facial features, scars, and so on well enough to tell that there were only two, and they were jumping around from one spot to another. Then when they got Chalat, the recorder showed them suddenly appearing next to him, cutting his throat, stripping him of his equipment, then disappearing, equipment and all."

"Well, man," the commander burst out, "who were they?"

The Executive Officer was enjoying himself. "The natives of the planet, sir."

"But, according to the Intelligence reports of the pre-landing survey, the natives are very primitive. If I remember correctly, they practice a very destructive form of agriculture, so that they have to shift their villages every few years, and most of their protein comes from hunting. They have no cultures to speak of. How do they get the technological capability to bollix up our surveillance devices? Are the Kregs supporting them?"

"While it is possible they are getting Kreg support, sir, I think it is unlikely. If the Kregs had got another jump on us in the detection field, they would have made the attack themselves, rather than trying to work through primitive allies like the local natives. I believe that the detectors were giving us a true report of exactly what was going on. The attackers were really jumping from one place to the other without being in between. I believe they are natural teleports. And considering the way they coordinated their attack, they are telepaths, too."

"Pardon me, General."

The Task Force Commander turned to his Operations Officer. "Yes, Colonel Arun."

"As you know, sir, before I was recalled to active duty I was Professor of Military History at the University of Callisto. My period of specialization was the XXth Century. One of the more common types*of military action during that

period was something called 'guerrilla warfare'. It was commonly used by nations under occupation by foreign invaders, colonialists, and so forth. It is particularly adapted for use by weak and poorly organized forces against strong, well-organized forces. It seems to me that's precisely what we're up against here. It even fits the traditional pattern, since the first action of the native guerillas was arms-gathering. They obviously carried out last night's raid in order to get their hands on some of our weapons."

"Supposing what you say is true, what do you recommend?"

"In the XXth Century, guerrillas weren't defeated until the forces opposing them learned to eliminate the genuine grievances of the people who supported the guerrillas. I recommend we use the same course of action here. We must communicate with the natives, explain our reasons for coming here, and use some of our resources in solving their more serious problems. In that way we can gain their support instead of their enmity."

"Now wait a minute," interjected Colonel Bunyarit. "Let's not go losing our sense of perspective. Our job here is to fight the Kregs, not to wipe the noses of a bunch of natives. With all due respect to Colonel Arun's academic background, I think that's precisely what his recommendations are: academic. We've got a defeatist attitude. Already we seem to think they can

come in and repeat their raids as often as they feel like it. Well, last night they hit us without any warning. Next time we'll be ready for them. We ought to get many more of them than they get of us. And the raiding doesn't have to be all one sided. There's nothing to stop us from going out and raiding a few of their villages. After getting their noses bloodied every time they come after us, and losing a few villages too, they'll quit bothering us. That's the way to treat them. Let's not mess around with this do-gooder attitude."

"But Colonel Bunyarit, you're making precisely the same mistake nearly every colonial power made in the XXth Century. They felt that a show of force was all that was required . . ."

"Now you look here. I've been on worlds before where the natives started trouble—caravan raiding, robbery, and so forth. You shoot up their villages a few times, and they learn who's boss. You ought to get out from behind that professor's desk of yours once in a while, and find out how the galaxy works."

"Your attitude, Colonel Bunyarit, is typically military in its obtuseness. Your suggested treatment may be quite satisfactory for handling pirates and bandits, who value their village more than they value the loot they might acquire from another raid. But it won't work against a people who are united in their opposition to the foreign invader. To

them, the loss of a village is a small thing. They have their minds focused on the long pull, and are willing to make considerable sacrifices to gain ultimate victory."

"Are you trying to tell me that a bunch of half-naked savages, who haven't progressed beyond the crossbow, are going to chase us off this planet? If it even looks like they might do it, we can wipe them all out with radioactive . . ."

"Stop that task," from the Tank Force Commander. "Don't say it. Don't even think it. If ever the rumor got out that Terra had committed genocide, we'd have every race we know about, and as many we never heard of, down on our necks. If there's anything that unites the races of the galaxy, it's their opposition to genocide. We'll hear no more talk about wiping anyone out. If we can't settle the problem some other way, we'll get off their planet and let them alone. And cut out the bickering. We've all had a hard night; there's no point in taking it out on each other." Then in a calmer voice, "We seem to have two policies proposed. One is to make friends with the natives, the other is to civilize them with a blaster.

"It's clear to me, anyway, that if we try the second policy first, and it fails, we'll never get a chance to try making friends. So we'll try the policy of making friends first.

"Colonel Bunyarit, you seem to think we can defend ourselves against any more raids. Get busy

and set up the defenses. I think we're going to need them tonight. Colonel Arun, you will figure out how we're going to go about making friends with people who can vanish from our grasp before we can learn even one word of their language. That's all. Dismissed."

"Colonel Prapat," the Task Force Commander turned to the Provost Marshal.

"Yes, General?"

"Come to my office with me. There are a couple of things I want to talk over with you. Have you had breakfast yet?"

"No, sir."

"Neither have I. I'll have some sent in. I don't think any of us are going to have time for regular meals for a while."

"You know, General, there are times when I wonder how much more I can take of Arun and his professional attitude. He seems to think none of us ever read a book. I admit I've never heard the word 'guerrilla' before today, but, if these are guerrillas, their tactics don't seem to be much different from those of a lot of bandits I've fought on a number of worlds."

"Yes, I know Arun gets on a lot of people's nerves. First of all, Reserve officers who are called up at the outbreak of a war often have a low opinion of us Regulars. The fact that we had to call them up seems to be proof that we weren't competent to win the war without them. In addition, college professors seem

to have a firmly fixed opinion that a military officer is a wooden-headed dunce. And when you combine both in the same man, as we have with Arun, he sometimes gets hard to live with. However, don't forget he has a good point. Although the tactics may be similar, there is considerable difference between a bandit and a guerrilla.

"The motivation of the guerrilla makes him willing to put up with a lot of punishment. Even a long series of defeats won't dishearten him, and severe repression actually provides him with recruits from people who figure they have nothing to lose. As long as things are going to be tough anyway, they might as well be doing some fighting, and getting in a few licks at the people who are making things tough. At the moment I'm more concerned about Bunyarit. If there's anything I've learned in my career, it's that you should never underestimate an opponent. Treating an opponent with anything other than respect is a good way to get whipped in a hurry. If we don't treat them with respect, we'll try to beat them with half-measures, and get bogged down in a messy, indecisive war just like what happened to the XXth Century colonialists."

"That scared me, too, while I was listening to Arun. To a bandit a gun is a means to money. He gets one so he can use it to commit banditry, or to sell it to someone else who will use it to commit banditry.

From Arun's description, a guerrilla considers a gun a means to more guns. He uses it to get another gun, to give to a friend, so they can both go out and get more guns, to give to more friends, until they have a big enough force to wipe you out. I don't see how you can beat a thing like that."

"Don't be too shaken by the idea. Despite Arun's air of authority, he's not the only one around here who's read some history. He wasn't quite correct on one point. Historically the guerrilla was whipped when surveillance devices were developed to the point where he couldn't surprise you, when mechanized armies quit being roadbound and learned to move over any territory a man on foot could move over, and do it faster too, and when communications were developed to the point where you could coordinate the actions of a lot of scattered units.

"The trouble with whipping him is that it isn't enough. He won't stay whipped. You can't relax your guard. Even in supposedly pacified towns, troops have to go around in pairs, or they'll end up in an alley with their heads caved in. And you can't bring in civilians as tradesmen, miners, and so on. They'll be murdered as soon as you turn your back. As Arun pointed out, if you want them to stay whipped, you've got to eliminate their legitimate grievances. It's important that you be able to whip them, of course. If you simply do things for them after

they attack you, you merely whet their appetite for more. But if you do whip them, you can afford to take the attitude that they have been done an injustice, and deserve better treatment. If you neglect either half of the program, however, you're in for trouble.

"That's the sort of thing we've got to avoid here. In the long run we'll have to come to some agreement with these people or get off their planet. But in the short run, maybe we can hold our own against their banditlike tactics by using the tactics that work against bandits. That's what I want to talk to you about."

"Well, as a Provost Marshal, I've had considerable experience with bandits on various worlds. I've found that by and large bandits have a good sense of economics. If their gain from banditry is less than their loss from your reprisal for the banditry, they soon take up some other line of business, like fleecing tourists legally. But your reprisals, if they are going to be effective, have to be quick and precise. The bandits have to see the justice in your reprisal. If a small gang in a village engages in a raid, and you bomb the whole village, all you've done is get a lot of people mad at you. You've provided the bandit with allies. You have to identify the bandits and conduct your reprisals against them alone."

"That sounds reasonable. Now

how do you find out who the bandits are?"

"I think of that part of the work as nothing but conventional police procedures, just patient collection and sifting of facts. To get the facts, you have to know the area and the people. You have to build up nets of informers and agents in the villages. You have to keep watch over roads, and such natural convergence points as bridges, fords and mountain passes. If you suspect anyone, you arrange to have them watched constantly. You offer open rewards for information, and secret bribes and offers of reduced sentences for members of the gang who provide evidence. In extreme cases, you can take a few squads of police or troops and seal off a whole village. Then you arrange to interview each and every person in the village, separately. You arrange so that all the interviews are approximately the same length, so that no one stands out as particularly suspect for having spent a lot of time with you.

"In the meantime, while the others are standing around, you might have a doctor giving shots, passing out pills, giving a health lecture, or something, so you don't antagonize the innocent. Sometimes in these interviews you actually get information; other times you can only recruit agents who will later pay off for you. But that's the sort of thing you have to do. It's just patient, detailed police investigation, putting

together small scraps of information, and trying to get more information.”

“How would you apply your techniques here?”

“Frankly, I’m baffled. Even if I could get one of them to stand still, I don’t know how to talk to them. I don’t know what they value, so can’t offer rewards. And even if I did know what to use as a reward, they could steal it from me more easily than they could earn it anyway. It seems to be a circular proposition. If we could stop them from attacking us, I could probably build up a net of agents who could tell me who did the attacking. But, then I wouldn’t need to, since they wouldn’t be attacking any more. And until I can get information out of them, I can’t do anything to stop their attacks.”

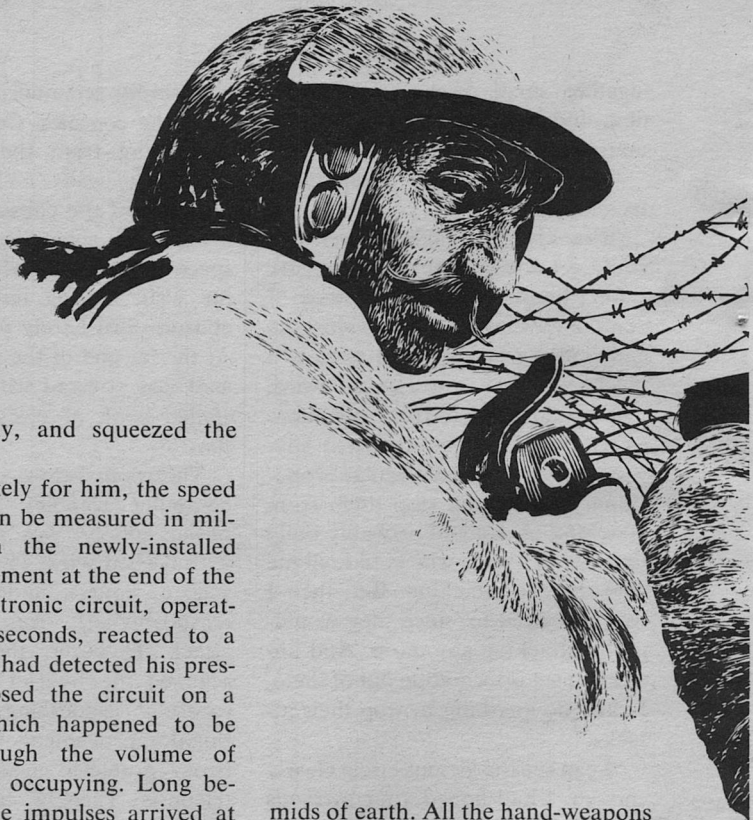
“I can see the vicious circle clearly enough. I had hoped your methods might help us to break out of it. All right, thanks for the information. Now I’d better go see what kind of defenses Colonel Bunyarit is working out.”

The Task Force Commander sat at his console in the Battle Control Center. All the other Duty Officers and NCOs were seated at their own consoles, all wearing battle armor. The consoles were tightly packed against one side of the long room, instead of being spread throughout the room, as was usual. A freshly-painted white stripe marked off the

now-empty remainder of the room from the consoles. Coils of barbed wire hung from the ceiling, festooned the walls, and draped over the sides of the consoles, filling every possible cubic centimeter of the space between the white stripe and the wall, leaving the men at the consoles just barely room to move. At the far end of the room, the end wall was covered with a newly-installed bank of electronic apparatus.

The room below, containing the computer complex and auxiliary power supply, was also crammed with barbed wire. The Center itself was, of course, underground, and reasonably safe from any ordinary attack. However, the commander scanned the interior of the room carefully, wondering if any additional improvements would make it better protected against attack by teleports. Then he caught his first glimpse of one of the natives, standing in the cleared portion of the room.

This particular native had spent the day practicing a particular tactic. He would choose a target, and a spot near it, teleport to the desired spot, attempting to arrive facing the target and with his gun pointed at it, fire quickly, and return to his starting point. He had, in fact, become quite proficient at it. Now, moving with the speed of thought, he appeared in the Battle Control Center just behind one of the consoles, corrected his aim on the duty



officer slightly, and squeezed the trigger.

Unfortunately for him, the speed of thought can be measured in milliseconds. In the newly-installed bank of equipment at the end of the room an electronic circuit, operating in microseconds, reacted to a sensor which had detected his presence and closed the circuit on a blast rifle which happened to be pointed through the volume of space he was occupying. Long before the nerve impulses arrived at his trigger finger, he was dead and falling to the floor, receiving more blaster bolts as he activated other sensors during his fall. A second native, attempting to retrieve his fallen weapon, was likewise cut down. After that, there were no more attacks on the Battle Control Center.

Sergeant Sawang Nakvirote drifted slowly across the base, at an altitude of slightly less than fifty meters. His squad, in diamond formation, followed him. Just below him stood a row of obviously fresh pyra-

mids of earth. All the hand-weapons of the Base, except those actually issued to someone, were buried under those pyramids. It had been explained that this would keep the natives from raiding the armory. They would have to fight for each weapon they captured. Ahead of him stood the vast parking area of the space field, normally crowded with ships, but now empty. All spaceships had been moved well away from the planet, as a precaution against attack or sabotage.

He was beginning to wonder whether the natives were going to



attack this night, or give it up as a bad job, when the crackle of blaster fire reached his ears. Almost simultaneously, a voice from the Battle Control Center blared from his communicator. "Attacking force in Barracks 34-D. Squad 17 counterattack."

Sergeant Sawang led his squad in

a high-speed, swooping dive for the front entrance of Barracks 34-D. It was a long, low, one-story structure, with a door in the center of each of the two long sides. Inside were two rows of cots, with a footlocker at the foot of each cot. A separate room at one end contained the precise number and kind of sanitary facilities specified by regulations for thirty-two men. Sergeant Sawang led the front vee of the diamond as it merged into a single line, passed through the door, and spread out

again. The rear vee of the diamond swung up over the roof of the barracks, turned, and opened fire on the figures who had suddenly appeared in front of the barracks, firing at the rest of the squad as it entered.

One of the figures dropped, and immediately another one appeared beside it, retrieved its fallen weapon, and disappeared. The rest of the figures had by this time also disappeared, although not without drawing blood in turn. The last of the squad members entering the barracks stopped short in mid-flight, as he was hit. His personal lifter, instead of lowering him to the ground, took him up to an altitude of a hundred meters, and hovered there. His body could be recovered later for proper burial. In the meantime, his weapons were safe from capture.

Inside the barracks, Sergeant Sawang found considerable damage, and some smoke from several cots which had been set on fire. However, there was no sign of the attackers. Half the men immediately took up positions at the front windows, to cover the entry of the rest of the squad. The others tried to cover the interior of the barracks, but without success. A native suddenly appeared in line with the doorway, fired once, and disappeared. A man just inside the doorway flung his arms out in a spasmodic jerk, then drifted toward the ceiling as his lifter attempted to

raise him to the programmed hundred-meter altitude. A native appeared on the floor below him, grasped vainly for his feet, and died on the spot as someone realized what was going on and fired. The dead man was unceremoniously hauled out the door by two of his comrades, and allowed to float upwards out of reach.

At this point Sergeant Sawang's communicator spoke up again. "We're sending Squad 32 to reinforce you. As long as the natives want to fight in Barracks 34-D, we might as well accommodate them. Try to capture a few of their weapons, if you possibly can."

Squad 32 was led by Sergeant Jirote Phranakorn. Switching channels, Sergeant Sawang spoke. "Jirote, this is Sawang. Since your squad's still at full strength, you take the main bay of the barracks, I'll take the 'fresher."

The reply came back. "Fine by me, Sawang. Cover me as I come in the door, then I'm going to have my squad sweep up and down the length of the barracks, in line abreast, so we'll provide poorer targets."

Sergeant Sawang hovered in the doorway of the 'fresher, and watched Jirote's squad sweep through the barracks in precise formation, half the men facing ahead, half to the rear. Again with a suddenness which defied belief, a group of natives appeared. Sawang

noted that these seemed to have different markings on their loin-cloths than the two he had seen earlier. There were eight of the natives, one for each member of Jirote's squad, and each native seemed to have placed himself directly in the path of one of the squad members. In a time-span so short that Sawang still hadn't reacted, there was the crackle of blasters, and the natives were gone again. Six of the squad members drifted toward the ceiling. The remaining two stopped, confused and uncertain. Their uncertainty was brought to an end as four more natives appeared at the far end of the barracks and sent their blaster bolts into the two remaining soldiers.

Sawang flung himself out of the doorway just in time, as more attackers appeared and fired at him. At the end of the crackling barrage of blaster bolts, he swung past the doorway again, glancing into the main bay as he passed. It seemed to be full of natives, all attempting to form gymnastic pyramids in order to reach the men floating against the ceiling.

Sawang zipped past the door again, flinging a grenade into the main bay as he went by. He led his squad into the main bay immediately after the blast, to find nearly a dozen of the natives crumpled on the floor, and several patches of blood evidently left by others who had escaped. He put his men to work immediately, getting Jirote's

men and their weapons out of the barracks. No sooner was that task completed when he heard another voice from his communicator. This one was flat and metallic, and he knew he was being addressed directly by the Battle Computer, not by any of the humans at the Battle Control Center.

"Switch your lifter to Remote Control." Sawang did so. "Your direction of motion and velocity will be altered at random intervals, to make your motion as unpredictable as possible. From time to time you will be ordered to look and point your weapons in a specific direction. Fire immediately if you see an attacker, and fire anyway if ordered to do so."

Sawang watched his men move around the interior of the barracks in a mysterious, seemingly pointless dance. They moved up, down, right, left, forward, backward, without apparent reason. Suddenly he heard a blaster bolt crackle past him, just after he had felt a sudden change in motion. He glanced briefly in the direction from which the shot had come, to see no one, then returned his gaze to his assigned direction. He spotted one of the natives, fired quickly, and missed. The attacker disappeared before he had another chance to fire.

The next few minutes were a confused, whirling nightmare. Sawang's men danced around inside the barracks at what would have been an insanely dangerous speed,

if they had had to depend on human reaction times to keep them from colliding with the barracks walls and each other. Attackers appeared, fired, disappeared. Sawang's men returned the fire as best they could. Neither side seemed to be able to draw blood.

Then Sawang noticed a subtle change in the pattern of the dance. All the changes in direction seemed to be nearly at right angles now, and they came at greater intervals. Furthermore, the direction he was ordered to look no longer coincided with his direction of motion. The flat voice of the computer came to him again.

"Look thirty-seven degrees." He did so, the direction being slightly to the left of his course. "Fire, and keep firing." He fired once, at nothing. He fired again, and just as he squeezed the trigger, a native appeared in the path of his aim. He was so surprised he hesitated before firing the third shot, which turned out to be unnecessary, as it passed over the dead native.

The next few minutes were another confused whirl. "Look forty-five degrees. Fire and keep firing." And another native down. "Look ten degrees. Fire. Look ninety degrees. Fire. Look. Fire. Look. Fire. Look. Fire." It was clear what had happened. The computer had deduced the habits of this particular group of natives, and their reaction times. It kept each human on a single course long enough for a native

to track him and decide to attack. It then predicted where the native would appear, and had someone else fire at the predicted point of arrival. That way the native was never alerted by a hostile move on the part of the human he was tracking.

Finally the crackle of blasters ceased. There was another human floating near the ceiling, and another dozen natives dead on the floor. The important fact was that this time all the dead natives were armed, except two who had died in the act of trying to retrieve weapons from their fallen comrades. The computer had caught on to that practice, too.

Before anything else could happen, Sergeant Sawang ordered his men to recover all the loose weapons, and then go back on remote control. However, apparently someone had decided that the Battle of Barracks 34-D was over. Another voice, this time a human one, came from his communicator.

"Squad 17, proceed to the Electronics Repair Shop. It is under attack."

The Electronics Repair Shop was a single-story structure consisting of a long, narrow central building with a number of shorter but equally narrow wings branching out on either side. Both the central building and the wings consisted of a hallway lined on both sides with small cubicles, each closed off by a door.

The building was entirely windowless, but there were doors at the end of each of the wings.

As Sergeant Sawang's squad circled around the Electronics Repair Shop, in a now somewhat ragged diamond formation, another message reached them.

"Sawang, this is Major Prasert." That would be Major Prasert Tanwong, Sawang's Battalion Commander. "The attackers are apparently trying to draw us into a fight. They've been appearing in the test cubicles, smashing some equipment, and leaving. By the time we get there, they're somewhere else causing more trouble. In order to keep them from wrecking everything, I'm going to have to put a man in every cubicle, with more men patrolling the halls as a backup. I've already got all the rooms in the northernmost wing manned. I want your squad to patrol the hall in that wing. As I get more men, I'll extend our control into the other wings."

Sawang decided that on the face of it the plan sounded good, but the natives might have some other surprises they hadn't revealed yet. Before he committed the remainder of his squad to a particular tactic, he wanted to reconnoiter the territory he was going to have to fight in. He left the squad to circle the building, and dove through the doorway at the end of the hall he was going to patrol. He came to the door of a cubicle, knocked, and opened the door. The soldier guarding the room

was floating back and forth across one end of the room, with his back to the end wall and his head brushing the ceiling. His gun was pointed toward the center of the room, ready to fire. While the man's course was fairly predictable, he still presented a moving target instead of a sitting one. Sawang nodded his head in satisfaction, waved at the man, and left the room.

He then studied the hallway thoughtfully. After his experience in the barracks, he didn't like the idea of his men moving up and down the length of the hallway, where they could be picked off easily by enfilade fire. Nor was he happy about the hallway down the central portion of the building. It was uncontrolled, and his men would be subject to flank attacks as they crossed the entrance to the hallway, at the center of the wing. He decided the alternatives regarding the central hallway were to attempt to control it, or to abandon it to the attackers and accept that his squad would be split into two halves, on either end of the wing.

The first alternative would be difficult to achieve, but the second went against all his training and experience. He decided to station himself at the juncture of the central hallway and his wing, keeping near the ceiling and partially protected by a corner, so that he could watch the hallway and fire if anyone appeared. He could then put two men in each wing, and his cen-

tral position would give him better control over the action as it developed.

He called the squad in and told off two men for each end of the wing. They were to stay abreast of each other, and facing in opposite directions. They would move in a corkscrew spiral along the length of the hallway, reversing direction as they reached the end, or middle, of the wing. He then took up his position at the middle of the wing.

Hardly had Sergeant Sawang gotten into position when a series of explosions rocked the building. He glanced around, and saw the door of one of the cubicles sag open, and smoke drift out. He called to his squad to maintain the patrol, and swooped for the nearest cubicle. He yanked the door open and swept inside, to find a native standing on a test bench and removing a blaster from the unresisting hand of the soldier now floating lifelessly against the ceiling of the cubicle. Before Sawang could fire, the native was gone, gun and all. He ordered his squad to stop patrolling and check the cubicles. He then tried the next door, to find it bolted from the inside. He blasted the lock and hurtled inside, to find the room empty and its guard dead and stripped of weapons. In the next room the guard was still alive, and the badly mangled body of a native lay on the floor.

"He appeared right in front of

me, Sergeant, and dropped a grenade on the floor. My gun was pointed at him, and I must have fired by reflex. He fell over the grenade and soaked up the force of the burst."

"Reflex or not, that's nice shooting. Keep up the good work."

Sawang returned to the hallway, to find it filling up with guards from the rooms which had not been attacked. He was in the process of sorting his squad out from the strays when a volley of blaster fire erupted from the central hallway. He turned to see a group of natives standing in the middle of the wing, having a field day firing at the troops in both ends of the wing. In the confusion, no one seemed to be able to organize any counter-fire.

Someone yelled "Out the doors! Let's get out of here," and a rush started for the doorway at the end of the wing. This escape route was closed by more blaster fire from natives stationed outside the doorway. An incredible jam formed at the door as men milled about, fired on from front and rear. Sawang and the other NCO's started herding the men out of the hallway into the cubicles, where they started returning the fire of the natives, who were now rapidly shifting their positions along the length of the hallway.

Suddenly a voice roared over the emergency communicator channel. "All troops in the Electronics Repair Shop. Take cover. Get under something quickly."

Sawang and his men had just ducked under a workbench in one of the cubicles when a shattering explosion sounded in the hall outside, followed by the earsplitting shriek of a one-man scout fighter as it whipped over the building at low altitude and high speed, then headed back for the stratosphere. There was now a gaping hole in the roof over the hallway, through which an orderly flow of men was escaping, while others still in the cubicles provided covering fire for them. Sawang led his men out in their turn, then circled back over the building. When all the men appeared to be out, he received permission to lead his squad back to look for wounded and retrieve weapons.

The fire from the scout had been aimed with precision, and had taken out the roof right over the hallway. This, of course, meant that the beams supporting the roof had been cut through at the center, allowing a portion of the roof to collapse into the hallway. They found a number of bodies, both human and native, under the wreckage. They dragged the humans free and let their lifters carry them out through the roof. The natives, they simply disarmed. As Sawang pulled a blaster away from one of the figures on the floor, he saw it stir slightly. He took a step away, then the significance of the event struck him.

"Battle Control Center, this is Sergeant Sawang, Squad 17. We've got a prisoner. He's been knocked

out, temporarily anyway. What do we do with him?"

"Good work, Sawang. Hoist him up to a hundred meters and hold him there so his friends don't try to rescue him, while we figure out what to do with him."

"Sorry I'm late for the meeting, General. I had an experiment in progress, and I wanted to be able to include the results in my report."

"That's all right, Doctor, we were just getting started. Sit down and catch your breath, and we'll hear from you in a few minutes. Now, Colonel Bunyarit, will you give your report?"

"Yes, General. First I'd like to describe some of the thinking that went into the defense planning for last night, then describe how it worked out. To begin with, we had to accept that the natives were teleports. It became clear that the ability to teleport also implied some sort of clairvoyance. If a person is going to teleport himself to some distant point, he has to be sure that there are no objects in the way where he wants to go. Simply remembering the place is not enough. Someone could easily have moved an obstacle into a place remembered as being clear of obstructions. Thus the question became one of how good their clairvoyance was. Did it, in effect, make them omniscient about all events anywhere? If so, we had no hope of defeating them.

“On the other hand, they all have eyes, and on the first night they attacked, it’s worth noting that all their victims were shot while silhouetted against a fairly bright starry background. Thus they still depend heavily on their eyes, despite the existence of clairvoyance.

“So I decided to assume that their clairvoyance was not much better than the minimum required for successful teleportation; that they could observe only a small area at a time, as through a peephole, but that they could scan the ‘peephole’ around to investigate a large area or track a specific target of interest. I assumed also that their ability to inspect some complex object would not necessarily tell them how it worked or what it did, if it depended on principles beyond their level of technological development.

“On the basis of these assumptions, I planned the defense. First, there were certain areas like the Battle Control Center, the Power Plant, and so forth, which had to be made into traps which even teleports could not invade successfully. Limits on time and equipment, of course, meant that the rest of the Base could not be so protected. So all weapons not being carried by someone were buried. All spaceships and other vehicles were moved out of the way to prevent attack or sabotage. Since any soldier standing in a fixed position could be attacked and disarmed before he

could react, fixed guard posts had to be abandoned. The simplest solution was to put all the troops up in the air and keep them moving.

“The obvious counter to this was to attack our unprotected installations, forcing us to move troops into them. However, I felt safe in assuming that the natives would be fairly unsophisticated. If they found a tactic that worked, they’d keep trying it. Nor would they be organized to detect our responses to their tactics, and change them as necessary. So I felt that the Battle Computer, with its ability to handle large amounts of data and deduce patterns from it, would give us an edge which might make up for the enemy’s ability to teleport, if our troops were drawn into a battle.

“I feel that the defense was quite successful. Certain points were defended with complete success. In those places where our men had room to maneuver, we put up a good defense, inflicting more losses than we took. In other areas, the battle was more nearly even. However, overall we lost forty-two men, while they lost one hundred eighty. I could say that is a very favorable ratio. I expect that we can make further improvements in the defenses before tonight, and if they attack again, we should be able to force an even more favorable exchange ratio.”

“Thank you, Colonel Bunyarit. Now Colonel Arun, you look like you want to say something.”

"Yes, sir. I beg to differ with the optimistic conclusions just voiced. First of all, the actions of guerrillas tend to be limited by the number of weapons available, not their manpower. And their chief source of weapons is capture from their opponents. Thus in combating guerrillas the measure of success is not the casualty ratio of the forces, but the ratio of weapons lost by each side. The attackers started the battle last night with what weapons they had seized the previous night, namely eighteen blasters, eighteen blast rifles, and fifty-four grenades. Last night they expended twenty grenades, and we recaptured twenty-five other weapons. However, they captured twenty-two blasters, twenty blast rifles, and sixty grenades. In last night's attack, then, they essentially doubled their supply of weapons.

"Furthermore, much of last night's defense was based on the assumption that they cannot teleport themselves into a position in space, say a hundred meters off the ground. It may be that they had never had to do it, but that is no reason to assume they can't learn to do it.

"In short, I consider last night a defeat for us. Without any change in tactics, they can come back and double their weapons supply again. And they may be able to change their tactics in such a way as to nullify most of our defenses."

"Thank you, Colonel. You have

some good points. However, things are not all black. We did manage to get a prisoner, so the night wasn't a total loss. Doctor, may we have your report now?"

The Staff Surgeon slid his chair back and stood up. "The most important news, of course, is the prisoner. When he was delivered to us last night, he was still unconscious from having a roof fall on him. Our first check, naturally, was to see if he had suffered any serious injury. A hasty examination showed that there were no bones broken, or anything like that. Next we made some rapid checks to see if any anesthetics we had would be safe and effective on him. We had to keep him unconscious, or he would have simply left us.

"It turned out that one of our standard anesthetics would work on him, and as far as we could tell it would be safe. Naturally we started with light doses, and monitored his heart and lung action. However, we, of course, had no idea what his normal pulse and respiration rate should be. The anesthetic seemed to do the trick, so we started sampling everything we could without doing him any permanent damage, as well as taking electrocardiograms, encephalograms, and so on.

"After about an hour, we observed that his pulse and respiration seemed to be weakening, so we cut down on the dose of anesthetic. This helped, but after a while he started to get worse again, so we

cut out the anesthetic entirely. In short order he returned to consciousness, and did the expected thing. He vanished right off the table. It was quite a surprise, even after having been told it could happen.

"In all, we spent about two hours examining the prisoner. We have a great deal of useful data, although most of it is still in raw form, and can't be used for anything yet. It must be remembered that we never examined him under normal conditions. He was knocked out when we got him, and was anesthetized in addition. So we are still not completely satisfied with our data. And in any case, we would like to have a lot more. We are performing autopsies on the attacker corpses. These, in conjunction with the data from the prisoner, are telling us quite a bit about their nature."

"If we managed to get another prisoner, could you do better with a new anesthetic?"

"Yes, General, we now know enough about them to be able to synthesize an anesthetic which would be both safe and effective."

"Do you have enough information to design a knockout gas sufficiently effective to have military utility, and with no serious side effects?"

"Oh, yes. That would present no serious problem. We could even design one which would be absorbed rapidly through the skin, so they couldn't avoid it by holding their

breath. We could even design it to have no effect on humans. I would say we could have a sample synthesized by noon. Any larger quantities, of course, would have to come from the Materiel Officer."

"All right, Doctor, you get your staff busy on the synthesis. Have them work closely with the Materiel and Armament Officers. I want a reasonable quantity of gas bombs available by no later than mid-afternoon. In the meantime, Colonel Bunyarit, get some high altitude patrols out, and locate a few villages. Then get a strike force organized. As soon as the gas bombs are ready, we're going to get us a few prisoners."

"But General, there's not much more I can learn from an anesthetized prisoner. What good will capturing a few more do?"

"I've got an idea about how to hang onto an unanesthetized prisoner. Now let's get busy. Meeting's dismissed."

"Another drink, Commissioner?"

"Thank you, General, I will. It's not the sort of luxury one normally expects at a forward base like this."

"I believe in being comfortable, Commissioner. Any fool can be uncomfortable. And besides, one doesn't normally expect to find a Commissioner for Native Affairs at a forward base, either. You realize, I hope, that we've already had one Kreg attack, and there may be more."

“Yes, but I’ve been under fire before. The Kregs can’t possibly be any worse than some of the natives I’ve had responsibility for. But tell me, how did you manage to work out an agreement with the natives? I’ve read your report, of course, but it’s so blasted brief. I mean, how did you learn their language, how did you analyze their culture, how did you learn what would induce them to behave? And for that matter, how did you manage to get them to hold still for you?”

“Commissioner, as you are aware, the basic problem was holding one, voluntarily or involuntarily, and getting the information out of him. By a stroke of good luck, we acquired a prisoner. Naturally we couldn’t hold him permanently, but from a study of him we learned enough to enable us to capture some more. It turned out that the ones we worked with had no inhibitions about telling us what we wanted to know, after we learned a bit of the language. After all, learning an alien language is a pretty well-developed technique, nowadays, and these people don’t have a very complicated one.

“We confirmed earlier reports that they move around a lot. They farm by burning off a stretch of forest, thus fertilizing the soil. They farm it for a few years, by which time it’s worn out, and they move on. Naturally they can’t come back to the same site until the forest is regrown. This means that each tribe

has to have a pretty large area it can call its own. Naturally there’s a lot of jockeying between tribes for particularly choice areas, such as those with good rivers, and so on. The social structure, as between tribes, approaches anarchy. Their Golden Rule is ‘Do unto others before they have a chance to do unto you.’

“We learned that about fifty years ago a spaceship crashed on this continent, and one tribe managed to get some modern weapons from it. They cut quite a swath for a while, until they ran out of power packs. None of the tribes, however, forgot what energy weapons were, or how they could be used. When we landed, a few of the nearby tribes viewed us as their golden opportunity. They gave each other the bare minimum of co-operation which would enable each to get some weapons. They then were each going to grab themselves some more territory. Eventually, I suppose, they would have fought each other for the best land, but it never came to that stage.

“Once we understood the situation, we simply flew over their villages and broadcast to them that if they didn’t let us alone, we’d supply weapons and instructors to their most deadly enemies. That was the stick. For the carrot, we recognized that in their chaotic situation, they would be willing to follow anyone who could offer them protection from each other. We offered them

that protection, if they would help us in enforcing it. That's where you come in. They quickly saw the good sense of our offer, and came to terms. The only problem was to prevent ourselves from being robbed blind by teleporting thieves, and we solved that by sealing all the buildings, putting on double-door air locks, and flooding them with anesthetic."

"But, blast it, General, you still haven't told me . . ."

"How we managed to hold a conscious prisoner? That turned out to be fairly simple. We realized that their teleporting range had to be

limited, since it was we who found them, not vice versa. So we loaded our unconscious captives into a scout cruiser, and took them several planetary diameters off-world. It turned out we guessed right the first time, and we had them far enough out they couldn't teleport back. When they realized they weren't going anywhere, we had no further trouble with them. They were model prisoners." ■





CHALLENGE

The Insurgent VS the Counterinsurgent

JOE POYER

The "brush-fire war" is the characteristic conflict of our time—largely because it is the only kind that can be won. Full-scale war today cannot possibly be won by anyone. The result has been a development of guerrilla warfare into a new kind of military science in which Napoleon, von Clausewitz and Lee are poor teachers—and the United States is handicapped because we don't appreciate the effectiveness of pure vicious, unrestrained terrorism.

Part I

Like most products in today's modern life, insurgency campaigns, remote area conflicts, guerrilla wars, limited wars, irregular warfare, anti-colonial revolutions, national liberation movements, unconventional warfare, et cetera and what-have-you, are not only available under different brand names, but they come in several sizes—guerrilla operations, regular size; regular warfare, limited war, and conventional war, in large economy size; and nuclear war, super-giant economy size. In the 1960's, the concern seems to have passed from the super-giant economy size to the large economy size limited war.

The guerrilla has come of age. His pediatricians were Mao Tse-Tung, Lenin, T. E. Lawrence, "Che" Guevara, and the Special Forces, Figure 1. He has been so psychoanalyzed that his behavior patterns are as rigid as any of today's teen-agers. What constitutes a limited war—or whatever you may wish to call it—has been defined and redefined to the nth degree.

Limited war: *Any armed con-*

flikt between or among non-major powers which involves more than a nominal amount of the war potential of the belligerent nations, powers, or groups, and in which no more than a nominal amount of the war potential of any one or more major powers is involved. This definition would seem to, and does cover pretty wide territory. In fact, some fifty-two armed conflicts that have taken place since 1945 can be included in this definition, from the Watts Riot in Los Angeles to the India-Pakistan Kashmir dispute.

Guerrilla warfare is only one part of Limited War and it is a military discipline in itself. Guerrilla troops are basically those who perform their military duties in an unconventional manner. And insurgency warfare is only one part of guerrilla warfare.

"An insurgency is considered to be paramilitary, military, or political—backed by military or paramilitary force—action taken by a *national*, with a well-defined grievance, against the legally established national government of his state."



FIGURE 1. *Left to right: Major Robert Rogers of Rogers Rangers, famed frontiersmen of the French-Indian and Revolutionary wars.*

Blackhawk, leader of the Sauk-Fox federation in the Blackhawk War.

Spanish guerrilla soldier, veteran of Napoleon's Peninsula Campaign.

T. E. Lawrence, famous Lawrence of Arabia, credited with formalizing basic insurgency tactics.

Mao Tse-Tung, leader of the most successful insurgency campaign in history. His writings now the bible of both the insurgent and counter-insurgent.

The Special Forces soldier, probably the most highly trained insurgent and/or counterinsurgent today.

Insurgencies—as the term implies—are military or paramilitary actions conducted by rebellious groups. The insurgent can be anyone from a backwoods farmer to the highest ranking military or government official. They can be elites, intellectuals, or dissatisfied urban or rural elements of the population. Counterinsurgency is exactly that—countermeasures taken by military

and/or governments against the insurgents.

In Greece, during the guerrilla campaigns at the end of World War II, 73,000 guerrillas wrecked the national life of 7,000,000 people. In Malaya; a ten-year campaign—1947 to 1957—was conducted by no more than 5,000 guerrillas at any one time that cost the British a billion dollars and required a total combined British-Malayan force of 360,000 men to suppress.

Fidel Castro is a prime example of an insurgent leader. He is an intellectual, a Cuban national, a product of both the rural barrios and the Havana slums and he was dissatisfied both with the reigning Cuban government and the social, political, and economic conditions of Cuban life and he set out to do something about his dissatisfaction.

Fidel Castro, operating like a Robin Hood in the Sierra Maestra Mountains first demoralized, then in 1959 overthrew a well-organized government and military in less than three years. At his peak, he may have had 1,500 actual guerrillas—he started with six in 1957.

He received very little outside help, other than foreign moral support, and until late in 1958, little more than apathy from his own people.

No matter what surgent operation you study—and *they are all successful to some degree*—relatively small numbers of actual insurgents are always involved. Former (?) President Sukarno's "liberation" troops, who periodically sneak across the Straits of Malacca into Malaya or into Sabab, Sarawak, Brunei, or New Guinea, are few in number, yet have tied up many times their number in counterinsurgent troops and weapons. Their secret—their mobility.

The history of insurgency warfare¹ shows clearly the success that resolute bands of insurgents can achieve. Whether they were English outlaws, American frontiersmen, Arab raiders, Viet Minh and Cong guerrillas, Greek, Yugoslav, or Soviet partisans, they all, knowingly or

unknowingly, followed the basic precepts for guerrilla warfare as defined—but not invented—by Mao Tse-Tung:

1. Start small with a well-disciplined force. Gain support from the people. Attack the enemy in lightning raids that damage, terrorize, and demoralize. Conduct sabotage. Move swiftly and never stay in one place. Take weapons, supplies, and munitions wherever you can. Leave nothing

FIGURE 2. The map of the world shows that every major continent has been the target of the insurgent at one time or another since 1945, with the notable exception of Australia. And, strangely enough, by virtue of having participated in more counterinsurgency campaigns than any other military unit, the Aussies are probably the most practiced counterinsurgents of all.



of value behind.

2. When you have established yourselves, and the "rightness" of your cause with the population, recruit. Mount larger raids. Agitate, sabotage, terrorize, fight. Begin to stand and fight, but spread yourself broadly and quickly. Leave nothing of value behind. Establish a political base, instruct, propagandize, convince. Establish a military structure. Establish semi-permanent, but quick reacting bases and headquarters.
3. "Recruit" to division strength. Now fight the enemy in pitched battle. Do not forget the guerrilla tactics, but now fight your demoralized and tired enemy conventionally. Take the offensive.

These precepts are the basics of any successful insurgent campaign.

INSURGENCY WARFARE

Insurgency warfare differs from conventional warfare in that the objective of conventional warfare is to win control of the state, or nation, by defeating the enemies' military forces. The strategy of the insurgent differs, in that to win control of the state, he must first gain control of the civil population before he can attempt to defeat the military forces.

The Communists are the prime exponents of unconventional warfare and have long realized its value. They have been able to do so much

with so little in so many areas of the world because:

1. They have learned thoroughly the techniques of gaining control of the civil population by combining effectively the positive incentives of a political doctrine applied meticulously from the grass roots up and the negative pressures of a terrorism applied against those who have refused to accept their leadership voluntarily.
2. They have mastered the principles and techniques of insurgency warfare. A form of warfare quite apart from frontal warfare.
3. They have directed their most determined attacks against countries whose territory is contiguous to the Communist empire, so that safe haven and training areas can be provided for insurgents and so that supplies can be provided clandestinely. And their insurgencies have met with notable lack of success in *remote* areas of the world, such as the Congo. (Remote in this case is defined as not having a common border with a Communist nation.)
4. They have also been able to exploit effectively the pent-up hatreds against former colonial powers and the slow pace of economic advancement.

Gaining control of a key part of the civilian population is absolutely necessary for successful insurgency

operation. Once having gained this control, the insurgent leadership is then in a position to use its fighting forces to great advantage against equal or superior government forces. Just as control of the air has become a prerequisite for successful frontal warfare, so has control of the civil population become a prerequisite for successful insurgency warfare. The struggle then must take place between the insurgents and counterinsurgents for the support and loyalty of the civilian population. Each side must try to organize the civil population into a tightly disciplined force through propaganda and police activities to break the grip exercised by its adversary.

Insurgency wars are not always Communist inspired. There are many that have occurred since 1945 that are purely internal and nationalistic in nature. While some are Communist inspired, equally important are such causes as national yearnings, relief from actual or alleged oppression, and the desire for national independence. The initial success of the Hukabalahap Campaign in the Philippine Islands can be largely attributed to the inequitable division of land and profits by the large land owners. These actual grievances were fanned by Communist controlled Huk propaganda efforts and the result was widespread support of the Huk movement in its initial stages.

Ernesto "Che" Guevara outlines the principles of insurgency warfare²

—based upon his experiences in the Cuban revolution—according to three principles which in reality are merely an extension of Mao Tse-Tung's.

1. "The forces of the people can win a war against an army."
(By this Guevara means the national government.)
2. "It is not necessary to wait for the fulfillment of all conditions for a revolution because the focus of insurrection can create them."
3. "The area for the armed struggle in the under-developed Americas"—or the world—"is the rural regions."

Guevara goes on to say that "war is subject to a definite system of scientific laws. Anyone violating them will meet defeat. Guerrilla warfare is governed by these same laws, but is also subject to special laws that derive from the particular geographic and social conditions in each country.

Guevara sees insurgency as a war which is a struggle between the population of the country and the national government. It is important to point out that insurgency—née War of Liberation—is a "struggle of the people." The insurgency force is merely the fighting vanguard of the people. It derives its strength from its roots in the mass of the population. The insurgent force is not, therefore, to be regarded as numerically inferior to the



Photo courtesy of North American Aviation

FIGURE 3. The OV-10A is the first aircraft specifically designed for counterinsurgency warfare. The aircraft is powered by two AiResearch T-26 turboprop engines and is capable of 270 knots. It can carry fully-equipped paratroopers, 6 combat infantrymen, 2 litter patients and attendant, or 3,600 lbs. of bombs and external stores. It is designed to live with troops at the front line if necessary.

army in its fighting, although it may be inferior in fire power. It is necessary to resort to insurgency warfare when there is support from a majority group but only a limited quantity of arms to defend against oppression. The fundamental tactic for the insurgent is to *strike and flee continually*, so the enemy can't rest.

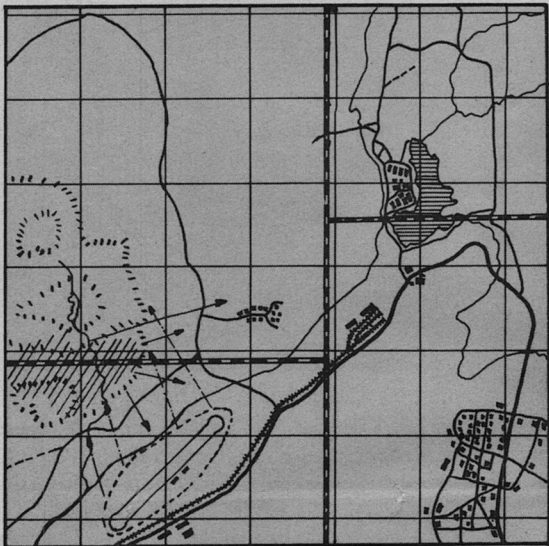
Guevara states that insurgent warfare is a phase of warfare that cannot of itself obtain victory. Mao Tse-Tung likewise maintains: "Since the war is protracted and ruthless it

becomes possible for guerrilla units to go through the necessary process of steeling and can change gradually into regular armies; consequently with their mode of operations gradually transformed into that of regular armies, guerrilla warfare will develop into mobile warfare."³ Insurgency warfare is considered the primary phase of a War of Liberation and it continues to grow in importance as the insurgent army acquires the characteristics of the regular army. Only when the insurgent army acquires regular status is it ready for decisive attacks. Primary strategy the insurgent must use is: ". . . to study and analyze the resources available to the enemy, his strength in men, his mobility, his popular support, his armament and his leadership. From this analysis the insurgent must then adapt his own strategy, his own method of fighting so as to take advantage of the weak points of his enemy."

FIGURE 4.

Counterinsurgency units must be so organized that they are not limited by geographic areas of command. If the insurgent operates in a mountainous area that straddles two internal military commands, the counterinsurgency units must be organized to parallel the insurgent structure and must not be limited by divided commands.

COUNTERINSURGENT
—————→
INSURGENT
—————→



The primary duty of the insurgent is to keep himself from being destroyed. If his survival is his primary duty; then, *his mobility must be his fundamental characteristic*. It is this characteristic that allows the insurgent to fight on a constantly changing front, thus avoiding any form of encirclement by the enemy. Guevara, like Lawrence and Mao, emphasizes again and again that mobility is the prime weapon of the insurgent.⁴ He illustrates this mobility with his most basic tactic: The insurgents surround an enemy column in small groups of five or six men in several locations—situated so that they in turn will not be surrounded—fighting can be initiated at any one of the several points. As the enemy advances toward the attacking force, the insurgent retreats,

maintaining contact with the enemy. As they retreat, another group attacks. The enemy moves to the new attack and the insurgents repeat the former action. With each successive operation, the enemy column is more and more immobilized, all without great danger to the insurgent. The enemy is forced to expend large quantities of men and equipment and his morale is weakened.

The insurgent army creates and uses an entirely new series of tactics. The most important, being the attack. When the insurgent mounts an assault on a position whether it is a city, fort, or a military post, the assault must begin with surprise. It must be furious and implacable, it must be fought harshly and quickly and as suddenly as it begins it must be completely stopped. The surviv-

ing enemy force must be made to believe that the attackers have gone. After they resume their normal activities the insurgents then attack in another part of the sector.

While the Soviets found it relatively easy to assume control of Eastern Europe, they were able to capitalize on the special circumstances surrounding the end of World War II. Chinese Communist insurgency tactics, on the other hand, are especially formulated to appeal to the interests and mentalities of rural dwellers.

Mao Tse-Tung realized in 1935 that possession of cities does not mean control of the country. Particularly in Southeast Asia which is ninety percent agricultural. He saw that the insurgents' main tasks had to be to destroy the widespread roots of support which the established government traditionally has, to build the apparatus of a communist-oriented political structure, and third, to use that apparatus to support the insurgent forces. This does not mean that the cities are neglected. Quite the contrary. The usual communist cells will be organized, leadership cadres recruited and trained, the government infiltrated by secret communist agents, and a campaign of terrorism and assassination carried out.

Combining both, Mao obtains leadership from intellectuals residing in the cities and the armed forces from the countryside.

One of the first goals of the in-

surgent leadership, then, must be to win the approval and cooperation of the people in the area. They will capitalize on the graft and corruption, or the inequalities of land distribution; anything which will gain them approval. They seek basically to enlist active, or at least, passive support. Until enough support is gained, the insurgents will fight only where forced to, to protect and/or expand their organizational activities. From this point on, the insurgents will build their revolutionary apparatus until they control their area, then expand until they control the countryside, and finally the government by simply removing the incumbent in one fashion or another.

This, then, is the chief challenge to the counterinsurgent forces—the *support of the population mass*. If the insurgents are in possession of this support, it must be won back; if not, they must be prevented from obtaining it. Figure 2.

FUTURE DEVELOPMENTS IN INSURGENCY

It can be fairly safely stated that insurgency operations reached the high point of efficiency with Fidel Castro. The ground rules laid by his predecessors were improved upon by Castro to such an extent that by the time the Viet Cong took the field, they were repeating the same methods developed by Mao, the Viet Minh, and improved by Castro. Counterinsurgency forces and tech-

niques have evolved to the point where fewer numbers of counterinsurgents, properly equipped, are now able to hold and ultimately to defeat the insurgents by applying their own tactics against them—at least in theory.

But this does not mean that the insurgent will not develop new tactics. It is important here to recognize that most—but not all—of the insurgency efforts in the world today are prompted by Peiping and to a lesser extent by Moscow. There is a definite plan to the various Wars of National Liberation. And the Communists in both camps have been quite open about admitting it. In fact, with the ever increasing rivalry between the two power blocs of the Communist World, increased efforts will also be seen in trying to win over the allegiance of the emerging insurgents. Where ten years ago, the insurgent had to go begging to the world's capitals for support; now, a mere ten years later, the various world's capitals go begging to him to *lend* support. And the United States does not take a back seat in this respect to the Communists either. Witness the latest incidents in Indonesia.

Promoting insurgencies has become a major part of world foreign policy. In early January, 1966, a worldwide meeting was held in Havana—the First Conference of the Solidarity of Peoples of Asia, Africa, and Latin America, with some six hundred delegates and

observers representing eighty-two nations. The emphasis in this tri-continental congress was, of course, on the imperialism of the United States, not only in general, but specifically in South Viet Nam. It is very interesting to note that especially in Latin America, the old line, well established Communist parties were not invited or represented, but that the insurgent movements were. Pedro Medina, leader of the Venezuelan National Liberation Front, and Senator Salvador Allende, the defeated Marxist candidate in the 1964 Chilean presidential election were two of the notables.

Le Monde of Paris reported that the “real stars were the lean, bronzed men who had arrived, after so many detours, from the guerrilla camps of the four fighting zones of the hemisphere: Guatemala, Venezuela, Colombia, and Peru . . .” The impact of the conference was directed at the revolutionary—and the revolutionary was to be supported by the Communist Bloc.

A special resolution passed by the Conference on Peaceful Coexistence declared: “Peaceful coexistence applies only to relations between states with different social and political systems. It cannot apply to relations between social classes, between the exploited and the exploiters within separate countries or between the oppressed peoples and their oppressors.”

Added to this resolution, one of

the most significant decisions to come out of this tricontinental congress was the resolution supporting and implementing the "International Days of Protest" that took place all over the world in late March 1966.

Indications are then that the insurgency movements all over the world, whether strictly Communist promoted or not, are being consolidated and backed by the Communists Bloc nations. That the various National Liberation Fronts were able to stir up the volume of support that they did in March from all segments of world population, bodes ill for the development of counter-insurgency operations. Insurgency is no longer a national issue, but an international one. It would seem that, with international backing at the so-called "grass roots" level, insurgency operations are moving into the big time in international politics. We can add one more step to the three stages of any War of Liberation as characterized by Mao Tse-Tung: "Gain international support from the oppressed peoples of the world."

Added to the military requirements of insurgency operations, will be the insurgency operations that must be conducted in the halls of governments around the world.

Militarily, with the increased backing by interested powers, the insurgents of the near, and not so near, future can expect to be better equipped—most likely out of the

arsenals of the backing governments; better educated—most likely out of schools such as Lumumba University in Moscow; and generally better trained to take the field. They will employ the latest in propaganda techniques with the propaganda being written for them by experts. They will need to spend less time in building the substrata grass roots support, and being better equipped, will be able to take the field as more conventional troops—supported assiduously by the local populace—and overrun the national government before the capital can be stirred to action.

Many of the guerrilla tactics employed by the insurgent are ideal tactics for the conventional soldier—but for one thing. Conventional troops require a great deal of logistical support. If they outrun their logistic supply lines, they are vulnerable to the point of complete destruction. But the insurgent, fighting conventional troops, applying guerrilla tactics and equipped with lightweight, small-caliber weapons and able to disappear into the populace, will have it all over the conventional soldier. It is not too much to expect the well-equipped insurgent of the future to use aircraft, light tanks, mobile weapons, et cetera against the conventional force with the same devastating effect he presently wields today. Vertical takeoff and landing, short takeoff and landing (VTOL and STOL respectively) are no longer drawing-board

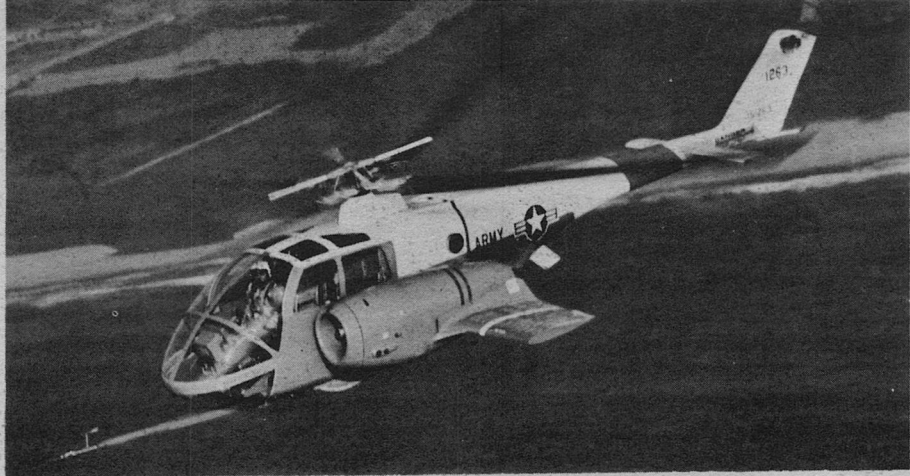


Photo courtesy of Lockheed Aircraft

dreams but flying realities. The Counterinsurgency (COIN) aircraft is in the final test flight stages and will see duty in Viet Nam before the end of 1966, Figure 3. Soviet-made helicopters are some of the best in the world and commercial American helicopters have more than quadrupled in sales since 1956. With such aircraft used by the insurgent operating from well-hidden bases in secured territory, the counterinsurgency aircraft and helicopter will encounter fire from both the ground and the air.

Insurgent wars in less than ten years will be conducted as much in the air as on the ground. That is not to say that the insurgents will use aircraft in the conventional manner against counterinsurgent troops and aircraft. No matter how far the insurgent advances technically, those utilizing guerrilla-war tactics still remain true to the most basic tenet of this type of warfare

FIGURE 5. The world's fastest flying helicopter, the Army Lockheed XH-51A is capable of sustained speeds of 272 mph. The XH-51A is a prototype of the faster, and more deadly aircraft that will find increasing use in counterinsurgency warfare—on both sides.

FIGURE 6. The famous old-standby—the T-28 Texan is being modified again. A good many aircraft types, developed and flown in World War II and Korea are finding increasing use in counterinsurgency warfare. As insurgents increase in the ability to gain international support for their operations, such aircraft will find themselves face-to-face in aerial combat.

—hit and run. Insurgent aircraft will be used to attack bases and supply dumps, raid shipping and ground vehicle traffic, add a new dimension to sabotage, raid pro-government population centers, re-



Photo courtesy of North American Aviation

connoiter counterinsurgent troop movements, and provide a logistics transport system to supply the insurgent operating in the field.

As a conventional force gains the upper hand when he attains air superiority, so, too, will the insurgent of the future strive for air superiority as he moves into Phase III—"Fight your enemy conventionally."

In summary then, the insurgent of the future—and the not-so-distant future at that—will increase in mobility and the ability to procure the support of the local population as well as gain international support; and insurgency wars are won for these two reasons. Deprived of his mobility and support—the insurgent withers and dies as he did in Malaya. Allowed to increase and improve his mobility and support, and he wins as he did in Viet Nam, Cuba, and Eastern Europe, et cetera, ad nauseam.

COUNTERINSURGENCY

"... When, as in Spain . . . the war is for the most part carried on by means of a peoples' war . . . a truly new power is formed and . . . peoples' warfare introduces a means of defense peculiar to itself."

Karl von Clausewitz⁵

Present Military Operations in Counterinsurgency

The most important aim of any counterinsurgency operation must always be to wean away the popular support for the insurgent and deprive him of his mobility. This cannot be emphasized too heavily. Insurgents cannot long survive the destruction of the basis of their popular support, or their ability to fight from a constantly shifting position.

Government forces have long been prone to use their troops against insurgents in large-scale operations. This is only natural



Official Marine Corps Photos

since most field commanders have been trained to handle troops for conventional or nuclear warfare. In the last few years, however, military operations all over the world have placed increased emphasis on unconventional or insurgency warfare training. Conventional military organizations are beginning to realize that if they inflict hardships on the civil populations in areas where insurgents are operating, only the insurgents will gain. If troops regard themselves as operating in enemy territory, they will behave accordingly. The results will always be popular bitterness which will turn neutral elements against the government.

The most bitter lesson learned in developing modern tactics to meet the threat of insurgency was that of the French. French soldiers, trained in the tradition of St. Cyr, Clause-

FIGURE 7. Such lightweight weapons as the 3.5 in. rocket launcher are popular weapons with both sides for use as anti-tank weapons or against fortified emplacements.

FIGURE 8. The .81 mm. mortar is almost a standard in the world's weapon arsenals. In guerrilla warfare it is used by both sides.

witz, and the European battleground insisted upon applying conventional tactics in their struggle with the Viet Minh. They mobilized great masses of men and equipment—all unsuited to the needs of the jungled terrain and ever-present rice paddy. Where the Viet Minh took advantage of the natural terrain, the French fought the environment; in effect found themselves fighting two separate entities. Bernard Fall's article "Street Without Joy" provides an excellent picture

of how the French obstinately refused to acknowledge that the war could not be fought on European terms.⁶ They never learned that the Viet Minh would not wait until the French laboriously moved their men and equipment into position. They attacked and faded away, leaving the French puzzled as to why their mighty machine of war did not produce the expected results.

The French, contrary to all evidence, insisted upon building and holding immense fortified posts

across the country. Dien Bien Phu is a prime example. And a prime example of why they failed: A static position demands supply—supply demands routes of access—routes of access demand trucks and roads—destroy the roads and the trucks cannot move—the static position becomes untenable and must be abandoned. It is as simple as that.

Aircraft can supply a static position—providing you have enough aircraft. The French did not. But, if the position is forced to remain static, then it becomes useless any-



way. Enclaves are of no value in a guerrilla war. If you have to wait behind fortified positions, he has free access to the countryside and the enclave forces lose their morale fighting sporadic testing raids, and the costs of supplying and maintaining enclave forces are far and away higher than equipping and maintaining offensive forces always on the move, seeking out and depriving the insurgent of rest, supplies, and firm, fixed bases.

The concept of mobility is the insurgents stock-in-trade. He moves quickly from point to point in small groups—a farmer by day, a soldier by night. To *meet* him on his own terms, the counterinsurgent must become as *mobile* as he. To *beat* him, the counterinsurgent must become more mobile and more effective.

Constant patrolling by lightly armed, small, mobile units supported by air and not following a fixed routine, yields several advantages:

1. They provide constant reassurance to and contact with pro-government elements which may lead to an opportunity to uncover the insurgents local agent structure.
2. They provide steady support to local self-defense forces. Self-defense forces are usually the most poorly trained, armed and paid—and often carry the brunt of the fighting. If inadequately supported, they are likely to give up and go

over to the insurgents.

3. Constant patrolling provides intelligence about insurgent moves.
4. Constant patrolling provides intimate knowledge of trails and terrain, particularly if counterinsurgents are not familiar with the local area.
5. Constant patrolling also provides the opportunity to fight the insurgents on terms which will be favorable in proportion to the government troops.
6. Constant patrolling also provides the civilian population with the knowledge that the government forces are available and are there when needed.

The United States Army Special Forces have recognized that the more active and aggressive the patrolling, the better the results. They maintain that counterinsurgency patrols must take the form of guerrilla hunting. The patrol, or patrols, must be tied to each other and to a central command post by fast lateral and vertical communication lines. Their support must include helicopters, used as flying gun platforms and reinforcement transports, and strafing and bombing aircraft. All operations must be linked directly to one command post for the fastest and most intelligent possible response. Once contact is made with the insurgent, the patrol can be reinforced if needed or more troops can be brought up by helicopter to



Official Marine Corps Photo

FIGURE 9. The 106 mm. recoilless rifle, like its predecessor the 75 mm, is used extensively in insurgency and counterinsurgency warfare.

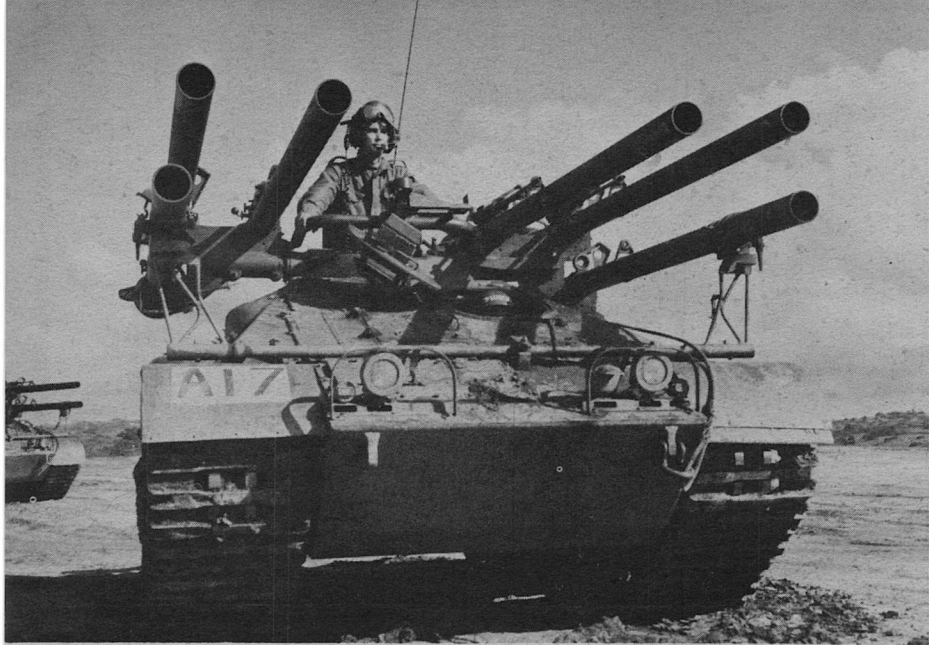
cut off the insurgents' retreat.

Patrols moving forward can attack frontally, while the reinforcements moving up from the rear can ambush the insurgent forces as they retreat down their routes of withdrawal. Helicopters and STOL transport craft such as the DeHavilland Caribou can drop quickly into small, roughly prepared fields to bring up heavy reinforcements. If accomplished quickly, the tactics of ambush and quick encirclement can be turned against the insurgent. Such insurgent hunting patrols throughout the countryside supple-

ment the local measures which are needed for the defense of sensitive points. The defense, incidentally, is always more effective if the support of the local population has been enlisted.

We now see that the fortified village, the defense of the strong point, and the constant patrol can all be integrated into one effective counterinsurgency unit. All other methods, such as high-level bombing, constant harrying attacks by troop-carrying and gunfire-platform helicopters, can all be added to supplement an integrated counterinsurgency unit.

Government forces frequently are organized on a territorial basis, particularly internal government military forces. The territorial bases



follow provincial boundaries with troops confining operations to their respective areas only, with commanders in each area communicating upward through a chain of command to the Capitol. By making good use of such arrangements, insurgents frequently are able to operate with relative impunity by straddling territorial division lines. An organization arrangement which denies such opportunities is needed.

For effective counterinsurgency operation, the military command must be reorganized and units assigned to each insurgent area, several of which may be separated from one another by secure areas, Figure 4. If, to provide effective military operations a single com-

mand is required, that command must be organized to include not only ground forces, but naval and air units where applicable—particularly air units. Measures for quick lateral, as well as vertical communications between commands and subordination of one to another with specific operations must be clearly defined. Civil and military authority must often be integrated. In some areas this may require subordination of all civilian authorities to military. In other arrangements, the military must be subordinated to civilian. Such arrangements will have the best chance when all concerned understand the politico-military character of the struggle.

The optimum size and composi-



Official Marine Corps Photos

tion of counterinsurgency units must be determined in each individual case by the military and civilian personnel who are acquainted with the country, people, and terrain in which the operations are to be conducted. Counterinsurgency will, in any case, require smaller and more numerous units than usual, operating on a self-contained basis. Operations in contested or insurgent infested areas will also require a well-developed logistics and intelligence service which is *intelligently* used and adequately supported right down to the level of the smallest independently operating tactical unit.

Weapons and Equipment for Counterinsurgency Operations

FIGURE 10. *The Ontos—Greek for the thing—is an ideal counterinsurgency weapon. It is capable of directing the fire power of its six 106 mm. recoilless rifles onto a target providing the tremendous range of fire power needed by counterinsurgents. More counterinsurgency weapons will be needed in the future to combat the insurgent as his technical ability increases.*

FIGURE 11. *The flame thrower, in competent hands is one of the best close range counterinsurgency weapons yet developed.*

FIGURE 12. *The 106 mm. Howtar—a cross between mortar and Howitzer—can be taken anywhere a tracked vehicle or helicopter can go and be ready for action in seconds.*

The prime requirements for counterinsurgency operations are mobility, good communications and the proper weapons. Helicopters and transport craft of suitable characteristics can give the counterinsurgent force a long-range mobility ordinarily denied the insurgent. Helicopters can provide the counterinsurgency forces with effective psychological as well as physical weapons. An attack helicopter flying at ground level over a rice paddy, hopping over a stand of trees and dropping down into the middle of the insurgents can do as much damage psychologically as machine guns and rockets can do physically, Figure 5.

Transport aircraft carrying specially trained paratroops can provide a serious deterrent to an operation by dropping the paratroopers behind the insurgent lines and catching them in a cross fire with frontal-

ly attacking ground troops.

Specially developed aircraft like the COIN fighter aircraft can provide the ground-operating counterinsurgency forces with effective support with their tremendous weapon loads. They are specially designed to provide attack and strafing capability with near impunity to themselves, Figure 6. As for the ground forces, flexible communications will

FIGURE 13. The 105 mm. Howitzer can bring a heavy concentration of artillery fire against enemy troop positions in a matter of seconds.

FIGURE 14. The Phantom II supersonic fighter bomber can exceed Mach 2. Equipped with Sparrow III rockets, it is a match for any opposing fighter in the world today. It can deliver more than twice the bomb load of a World War II B-17 bomber and operate from carrier decks or 5,000-foot runways.

Official Marine Corps Photo



provide advantages far superior to the mobility of the insurgents in terms of speedy coordination and reinforcement.

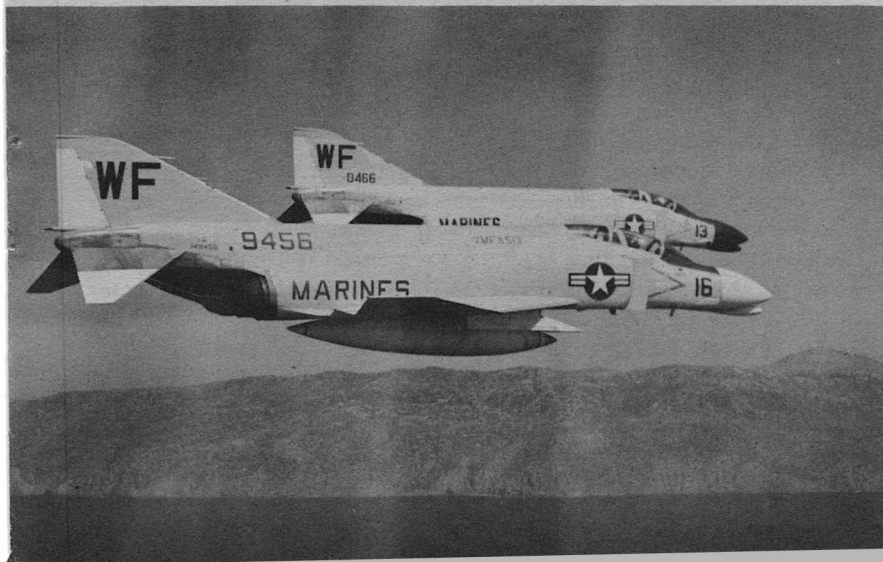
All of this puts a premium on light-weight equipment, weapons and ammunition. In small patrol units, each man must have the ability to lay down rapidly, almost continuous automatic fire. The new U. S. Army small arms, the AR-14 or M-14 rifle, M-16, and M-60 machine gun all appear to be ideal counterinsurgency weapons and they are light and strong enough for use in extremely rugged country, Figures 7-14.

Personal weapons, supplemented with light-weight mortars give the patrolling troops a heavy fire power which will usually be greater than that which the insurgents can muster against them, particularly in the initial stages of insurgency.

Arms should always be adapted

to the forces structured for counterinsurgency operation. Lieutenant General James M. Gavin comments⁷ "to cope with the Communist (limited war) program of this nature, requires good imaginative thinking and highly specialized tactical forces, and they must be technically superior to anything they encounter." Weapons which are used against the insurgent forces by the counterinsurgent troops must also be suitable. Aerial strafing may inflict casualties on insurgent columns in open terrain, but the insurgents usually learn quickly to cross such terrain at night. For the most part, fighter and bomber planes, and particularly jets, travel too fast to permit the pilots to identify the insurgents on the ground. If not used with extreme care, the result of their use will be embitterment of innocent peasants and their leaders. The use of napalm has created particular

Photo Courtesy of McDonnell Aircraft



and lasting bitterness in the countryside where they have been used, such as in Korea and in some parts of South Vietnam. Bombing and strafing, therefore, are likely to create further sources of insurgent recruiting unless carefully used.

The basic principles of counterinsurgency military operations then must be to maintain the offensive, thereby denying the guerrillas the initiative. The Communist insurgents' strategy in turn will be to attempt to seize and hold the initiative by mounting a variety of attacks against fixed installations so that large government forces are pinned down defending towns, villages, rail lines, power lines, ports and other vital installations.

The counterinsurgent unit must have these objectives:

1. To keep the insurgent units off balance at all times, force them to flee continuously from the attacking counterinsurgent unit, thereby minimizing their opportunities for mounting attacks on vital communication lines and military installations or to lay ambushes.
2. By maintaining the initiative to force guerrilla units to overrun their intelligence screens thereby denying them the protective cover they need to survive against superior military forces.
3. To prevent guerrilla forces from grouping for strong attacks against isolated points.

4. To tire them out and keep them tired through constant offensive acts against them, to force them into more isolated hinterland where food supplies are less and less available, to force them through constant offensive action to expend their limited ammunition.

Whatever the means used to carry out offensive strategy, the basic and overriding necessity is that counterinsurgent forces are organized early enough and strong enough to meet at the outset the attacks of the insurgent forces. Too little and too late has been the normal reaction of governments to the development of such troops. The core of the counterinsurgency troops must be highly mobile attacking forces. Normally it need not be substantially larger than the insurgent elements opposed to it. It should be able to meet and defeat insurgent forces essentially on their own terms, that is with small mobile units, capable of moving in patrols over extended periods and in any territory. As soon as one patrol is withdrawn for a rest, another should take its place.

A strategy of constant offense can effectively deprive the insurgents of the opportunity to conduct war on terms favorable to themselves. As a basic lesson in counterinsurgency warfare, a French military commentator has written: "There should be no fortified posts except those necessary for promoting mobility."

TO BE CONCLUDED

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Kelly Freas

Symbols

*When you don't have
the objective physical force
to achieve what you must—
you try the magical method of
symbols, the magic wand of
words and arguments.
And sometimes that blinds you
to the objective power
you do have!*

CHRISTOPHER ANVIL

Analog Science Fiction / Science Fact

Colonel Wade Daniels, newly-appointed chief of the diplomatic mission on the planet Knackruth, stood on the snow-covered ledge in the shadows of the evergreens, and looked down on the yellow cannon-flashes and rolling smoke in the valley below.

Mattison, long the mission's communications officer, stood beside Daniels. "Well," he said, "there go the mines. It was a fool setup to leave them to local protection."

Daniels blew out a cloud of breath that slowly drifted away. "The Gurt may still win."

"No, sir. They're caught off-base. Their idea was to hold at that river, bring up supplies and reinforcements, and fight later at better odds. But the river's frozen a month too soon. Now the Ghisrans don't have to bridge the river, or come over in boats, under Gurt fire. Now they can *walk* across. And the Gurt aren't ready for that."

Daniels frowned. His orders stated: "Your primary mission is to secure the safety of the quadrite mines on Knackruth. To this end, you are authorized to treat with any of the local powers—"

The trouble was, only one of these local powers at a time had the mines. But they were always either fighting, preparing to fight, or recovering from a fight. Eventually, the mines were bound to change hands. And while dealing with Gurt was bad enough, the Ghisrans were bound to be worse yet.

"Damn it," said Daniels, "if those mines are overrun a lot of automatic machines, that can't be replaced, are going to get smashed."

"Yes, sir. The Ghisrans will enjoy that. But at least you got the machine operator out."

Daniels grunted and ignored that comment. "Meanwhile, the quadrite supply from here will be cut off, and as I heard it, this is the last developed source in the sector. But our ships have *got* to have quadrite. As a result of losing these mines, we could lose the whole sector."

Mattison nodded. "The mines should have been fortified. We've got weapons that would scare the Gurt and Ghisrans combined out of a hundred years' growth. But no, someone figured that we could save the effort it would take to fortify the mines, and apply that effort elsewhere, by leaving the Gurt technically in control, and paying them for the ore. That way, we wouldn't waste effort. The trouble is, that means we're leaving it up to a weaker power to see that *our* breath doesn't get shut off."

Somewhere behind them, there was a faint thud, and a fainter grating sound.

Mattison glanced around, then said, "It's only Sarge." He turned back to Daniels, "Sir, I'd better go in and see if there's been any reply to your message."

"Go ahead."

Mattison saluted and left, hurrying to the communications cabin.

A bulky, furry form approached Daniels from the right rear, outlined fuzzily for a moment against a moonlit section of the sheer cliff wall that rose out of sight at the back of the ledge. The furry form raised a mittened hand. Daniels returned the salute.

"Sir," said Sergeant Malinowski, "there's a bunch of Ghisrans down on that rock shelf. It's only a matter of time till they find the handholds."

"You lowered the rock into place. They can't get past that."

"They may go up overhead and drop grenades on us." The sergeant's voice held a note of reproach, as if he blamed Daniels that they'd been discovered.

Daniels said dryly, "You think you could have done a better job bringing that mining-machine operator in?"

"Well, sir . . . there must have been tracks—"

Daniels snorted. "Instead of landing her airsled inside the box canyon, so she wouldn't be seen from outside, she came down out on the flats, and *taxied* in. She taxied almost to the big tree where I was waiting, then she jumped out, and fainted. Sure there are tracks. My tracks, from here to that tree, where she was supposed to land. Her tracks, all across the flats and into the canyon, to that tree."

The sergeant blew his breath out wearily. "She must be as fouled up as everything else on this planet."

"And then some," growled Daniels. He took a last look at the moonlit valley, and headed back toward the communications cabin. The sergeant followed.

Underfoot, the snow gritted and squeaked as they walked. Daniels studied the tall trees and the cliff wall, his practiced gaze picking out the camouflaged cylinder that was the rebuilt, dual-drive reaction-and-gravitor derelict they called "The Bucket." This looming weaponless hulk was their only way to get home if the situation on the planet broke up completely, and Daniels was thinking that one good shell hit would finish it. And, if there were Ghisran troops down on that rock shelf—"There aren't any grenades here, I suppose?"

"No, sir. Nothing but sidearms."

Daniels nodded. They reached the cabin, and Daniels opened the door on another form of trouble.

Two men, the communications officer and a young civilian doctor, were standing inside, their brows moist with perspiration, their faces twisted in eager attentiveness. Before them, seated in the cabin's one comfortable chair, was a well-curved woman in her middle twenties, wearing dark slacks and slippers, and a tight black sweater that clung to her as if it had been sprayed on.

For an instant, the sudden sight of this femininity struck Daniels with the impact of a warm cozy

cabin after the long chill of the outdoors. Then he heard her voice:

“. . . So then I punch a 617 on the Master, trip the override release, and the new matrix test-sorts the bounce-back. If it's O.K., that knocks the 'DIG' light on, and I lock the board. If the 'BALK' lights up, then I punch out a 618 or a 620, and try that."

"Wonderful," said Mattison, his voice oozing sincerity.

"Fascinating," said the doctor, his voice low, intense, and vibrant. "What do you do *then*, Robyn?"

Daniels glanced at the sergeant, who was staring at the woman glassy-eyed.

"Well," she said, putting one finger to the corner of her mouth, "then I usually heat up a cup of hot chocolate—not too much, you know—on account of the figure—and watch the hypnox till the ready-bell goes off again. Then—"

Daniels glanced around. To his left, the tight-beam communicator lit up with flashing lights.

"*Mattison!*" snapped Daniels.

The communications officer looked around glassily.

"*Get that message!*"

Mattison sprang across the room.

At Mattison's abrupt departure, the woman blinked, and one hand flew to her lips. Her eyes grew large. She held her other hand out to the doctor, who readily took it. Holding her hand, he looked to Daniels like someone who has taken hold of one of the grips of an electrical

demonstration machine, and now can't let go.

The sergeant gave a grunt of disgust.

Daniels cleared his throat. The doctor's face registered such a state of ecstatic pain that it seemed unthinkable to intrude. But with an effort, he said, "Doctor."

There was no response.

"*Doctor!*"

The man's eyes came to a focus. Daniels said, "Did you see the local Ruler before you came back?"

"Yes. Yes, I saw him."

"How did he seem?"

"Medically, or socially?"

Daniels felt a spasm of irritation. "They're two parts of the same thing. Naturally, I want to know both."

The doctor absently let go of the woman's hand. She drew herself together, and sat large-eyed and tense, as if she might explode into a scream at any moment.

The sergeant walked across the room to pick up a folded blanket on the lower half of one of the cabin's two sets of double bunks, walked back from a direction out of range of the doctor's vision, and offered the blanket to the woman. She blinked at him, smiled nervously, and the sergeant smiled back winningly. She accepted the blanket. He helped tuck it around her.

Daniels, momentarily distracted by this maneuver, heard the doctor say ". . . Surprisingly well, considering the stress he's been exposed to

lately. But the premature freeze seems to have thrown the Gurt military into disorder."

"Their plan was still the same?"

The doctor nodded. "Of course, the freeze wrecked the plans. They'd expected to hold the Ghisrans at the river for a month, and now the river's frozen. When I left, the new plan just seemed to be to fall back as slowly as possible."

Daniels nodded thoughtfully. "If the weather should suddenly turn warm again, the Ghisrans might find themselves with a flowing river between themselves and their supply dumps."

The doctor nodded vaguely, his interest obviously wandering away. He smiled and glanced down fondly at the woman. Her back was turned to him. She and the sergeant were talking to each other, their voices low, their heads about six inches apart.

Daniels was watching the play of emotions across the doctor's face when the sudden tearing of paper announced that the message, whatever it might be, had come to an end.

"Sir," said Mattison, his face pale, "here it is."

Daniels tensely took the yellow sheet of paper, skipped the heading, and read:

"Your request for aid has reached us as our resources are stretched to the limit.

"The only ships close enough to

reach the planet in time are the superdrive ore-freighter and its tenders. These are all unarmed, and the freighter itself cannot operate within the planet's atmosphere.

"You state that the national forces of Gurt, on which we have relied to defend the quadrite mines, have suffered a series of disasters which have brought a coalition of their enemies within striking distance of the mines. You have not been able to deal with the coalition, or to bring about a truce. You remind us that due to the original agreement with Gurt, your only ship is unarmed, and your mission is without effective weapons.

"In reply, let me repeat that loss of the Gurt mines would be catastrophic.

"Quadrite is essential to fuel our combat ships' drive-units. It is also rare. Loss of these mines would interrupt the flow of quadrite in a large region of space. We are working on a narrow margin. Any interruption in the flow of quadrite will operate on our defensive posture like a cataleptic seizure.

"I do not need to mention that whoever is in charge on the planet, if this happens, will be held directly responsible, and punished with the severity ordinarily reserved for acts of cowardice in the face of the enemy."

Daniels looked up.

From the valley outside came the reverberating crash of artillery. In his mind's eye, Daniels could see

the numerically superior Ghisrans driving the Gurt troops away from the river and back from the mines. What, he asked himself, could *he* do about it? He had three men, one of them a civilian, plus a female mine-machine operator subject to hysterics—and no weapons but sidearms.

The absence of conversation in the room caught his attention, and he glanced around.

The doctor had his hand on the woman's wrist, and was glancing at his watch. She had a thermometer in her mouth, and was looking up at him worshipfully.

The sergeant was disgustedly shrugging into his fur coat. Mattison, heavily bundled up and nervous, was just going out the door.

Daniels looked back at the message:

"I cannot offer you reinforcements, or even any specific suggestions. However, I will give you a piece of advice that I have found useful:

"Do not operate on the assumption that the situation is hopeless. *Earnestly seek a solution.*

"Remember that our minds normally do not think in terms of reality, but of symbols. The mind selects a few outstanding characteristics of an object, combines them into a symbol, and mentally manipulates symbols to determine what will happen when the corresponding objects act in reality.

"But the symbol is not the object. The mind, in forming the symbol,

originally selected certain outstanding characteristics, combined them, and henceforth takes the symbol as a reliable representation of the object. But what was originally a minor characteristic may, in a different situation, become important. Because of this inaccuracy of symbols, an apparently hopeless situation may contain an unseen solution.

"Don't give up. Break the situation down into its component parts, and examine each part in detail. Picture the way the parts fit together as clearly as possible. Imagine this or that element to be changed. Picture a favorable situation related to the present unfavorable situation. What change would bring about—"

Outside, there was a reverberating crash of artillery.

Daniels crushed the message and swore savagely.

Across the room, the woman put her hand to her mouth.

The doctor glared at Daniels, and gestured imperiously for silence.

The door flew open, and the sergeant came on in a whirl of snow.

"Sir, the communications officer wants hot water."

"Then get it." Daniels frowned. "Wait a minute. What for?"

"To unfreeze the hatch of The Bucket. He says we better get ready to clear out."

"All right. And while you're at it, set the internal temperature up from maintenance minimum to standby."

"Yes, sir," the sergeant answered.

"But nobody had better touch those controls."

"No, sir."

"Did you hear anything from that shelf below the ledge?"

"I listened. There wasn't a peep." Daniels nodded.

The sergeant took a large container of hot water from the big iron stove and went out.

The doctor bent over the woman's chair to murmur soothingly.

Daniels sat down near the communicator, and finished reading the message. Then he dutifully analyzed the situation. The trouble was, the river had frozen, and the Ghisrans could now cross to drive back the outnumbered Gurt. To deal with the problem, he had a communications officer, a master sergeant, a civilian doctor, an hysterical woman, an unarmed escape ship, several handguns, a hideout that the Ghisrans had located, and the highly-specialized mining machines. Which of these things had some quality that he had overlooked?

He turned the problem over in his mind.

Outside, there was a heavy, jarring thud.

Daniels went to the door, and looked out.

Light snow was drifting down through the moonlight. Everything looked the same as before, but the artillery fire had again died away, bringing comparative quiet.

From somewhere came a faint rushing sound.

Daniels reached back, pulled the door shut behind him, and glanced around.

Something large and vague blurred down through the moonlight past the edge of the ledge.

From below came a heavy thud, and a rolling, smashing sound.

A shower of small objects flashed past, and a moment later there was a clatter from below.

Daniels sucked in his breath and glanced up.

From somewhere overhead came a low voice, followed by the gritting of metal on rock.

The hatch of The Bucket came open, and the voice of the communications officer floated out:

". . . Just a little artillery fire down there. Nothing to worry about yet."

Daniels called up, "Sergeant!"

"Sir?" came a muffled voice.

"Unlock the control panel. Throw both master switches into the 'on' position. Can you hear me?"

"Yes, sir. Unlock the control panel. Throw both master switches 'on'."

Daniels opened the cabin door.

The doctor was closing a little bag, and saying something to the woman, who was smiling back adoringly.

Daniels said, "Throw a coat on and get out here fast. Both of you."

From overhead came a grating noise, then a heavy rumble.

The communications officer ducked past Daniels, rushed into the cabin, seized hold of a square brown handle on the tight-beam communicator, pulled out a section about six inches by eight in cross section, and bolted past with it.

The doctor's brows came together.

"Shut that door, you fool. You'll chill her!"

From somewhere overhead, came a crushing, grating noise.

Daniels said, "Get her out and into the ship. We're leaving."

"Impossible. She can't be moved."

"Then stay and get crushed."

Daniels crossed through the shadows to the cylindrical base of The Bucket, took hold of the handgrips, and started to climb. He was about halfway to the hatch when some impulse caused him to look up.

Through the light, gentle, moonlit snow, something dark and big plummeted down, straight for the ledge.

Daniels froze.

The boulder struck a projecting bulge of rock, bounded off, and its main mass crashed through the trees beside the ship, taking one of them with it and leaving the ship in full moonlight. A smaller chunk of rock droned past on the other side, to rip away a remnant of the camouflage net that had hidden the ship. Smaller rock fragments clattered down the cliff face to land all over the ledge. From further below came a splintering crash and explosive cracking

sounds as the boulder smashed through the forest.

Daniels climbed fast up the side of the ship and in through the hatch.

From below came the doctor's voice.

"Wait!"

Daniels swore, and looked out the hatch. Down below, the doctor was hurrying the planet's solitary Earth female across the ledge toward the ship. As they came, he protectively bundled a heavy coat around her.

"Sir," said the sergeant urgently from the control room, "we're all set to lift off."

Daniels said angrily, "Go get a rope."

The sergeant swore.

Down below, the doctor had reached the base of the ship, and was now pointing out the handholds. His voice was a loving, protective murmur. Daniels smiled sourly.

A feminine voice drifted up from below.

"I won't. I can't do it."

"You *can*. Just take hold—"

"No. No, I *can't*."

"Robyn . . . please, dear. Look, put your hand like this, then—"

She jerked back.

Daniels looked up at the cliff face.

The snow drifted steadily down in the moonlight. The cliff loomed vaguely up out of sight.

From somewhere up there came the gritting of metal against rock.

The sergeant leaned through the

inner air-lock door and pressed something into Daniels' mittened hand.

"Sir, the rope."

Daniels stripped off his mittens, and quickly tied one end to a brace over the door. He leaned out.

Down below, the woman suddenly broke away, and ran for the cabin. The doctor ran after her, caught her, and pulled her back toward the ship.

Daniels said, "Sergeant, get to the controls and get us out of here the instant I say 'Lift'."

"Yes, sir."

Daniels leaned out the hatch and looked down at the whirling knot of arms and legs. The doctor's voice told of shifting feelings as he and the woman flailed around from the ship to the cliff edge and back again.

"Please, Robyn! Robyn, *look*, dear . . . Hey! WATCH OUT! We're right on the edge—*Robyn!*—Ouch!—*You fool, stop it!*"

A burst of ferocious profanity accompanied a second escape from double suicide, and Daniels, after a hasty upward glance, concluded that the psychological moment had arrived. Cupping his hands to his mouth, he shouted, "*Knock her out!* We'll haul her up on a rope!"

There was a solid thud and grunt.

Daniels heaved out the rope.

"Mattison!"

"Yes, sir."

"Help me here!"

Mattison squeezed into the air lock, and the two men took hold of

the rope. Down below, the doctor straightened and called up tensely, "All right. I'll steady the . . . I'll steady her."

Daniels and Mattison pulled on the rope.

From somewhere up above came a grinding crushing noise, a thud, a continuous heavy grinding rolling sound, the clatter of small rocks and gravel falling, a second heavier thud, and then silence.

"Hang on!" yelled Daniels. He turned to shout over his shoulder. "Gravitors only! *LIFT!*"

There was a whine, and a surge of thrust that all but buckled his knees. The rope cut into his hands. Then the cliff was falling away. From somewhere came a heavy solid crash, then a noise like an avalanche.

The whine was rapidly climbing to a scream.

"Sir," yelled the sergeant, "gravitors won't hold the overload!"

Daniels shouted over his shoulder, "Balance on the center engine!"

There was a roar, and a reddish glare lit the snowflakes.

They got the inert form on the rope up over the hatch edge, and the doctor, his face scratched and bleeding, climbed in.

"Sir," shouted the sergeant. "What course?"

Daniels turned to Mattison, "Get that hatch shut, and make sure she doesn't come to and go berserk in here." He stepped through the inner hatchway into the control room.

The sergeant said, "There's no place to go down there, sir. We'll have to take her up, and fast."

Daniels glanced at the outside viewscreen. The screen showed the scene below, the moonlit snow-covered plain, crisscrossed by the tracks of animal-drawn carts and sledges, and alight with the flash of cannon. Through the drifting powder smoke, the river, which cut the battlefield in two, was shown by the sharp black shadow of its bank on the snow-covered ice. In the distance, off to the south, the defending Gurt troops still clung to their positions on the river bank. But below, the Ghisrans were across in force, with the Gurt line driven back toward the foothills, the Gurt troops further north almost cut off, and fresh attackers streaming across where the banks were low, almost directly below the ship.

To land anywhere nearby would mean coming down in a place that might be overrun before the next day was out. Daniels turned to tell the sergeant to take the ship up; then a phrase from the message spoke reproachfully in his ear:

". . . Acts of cowardice in the face of the enemy."

"I'll take it," said Daniels, suddenly determined to take the ship up himself, so there could be no slightest doubt who was responsible.

Another section of the message rose in Daniels' mind:

"Any interruption in the flow of quadrite will operate on our defen-

sive posture like a cataleptic seizure."

The sergeant stood aside.

Daniels thought savagely, "What can I do? The situation is hopeless."

"Do not operate on the assumption that the situation is hopeless. *Earnestly seek a solution.*"

"I have no weapons, no authority on the planet, no troops to command!"

"Remember that our minds normally do not think in terms of reality, but of symbols . . . what was originally a minor characteristic may, in a different situation, become important . . ."

"They're all generalities. I've got about two seconds to decide and then I've got to act."

He slid into the control seat, feeling its surface conform to him, to brace him against the impact of any sudden acceleration.

Regretfully, he reached for the controls.

Another section of the message recurred to him as he gripped the controls:

"Picture a favorable situation related to the present unfavorable situation. What change would bring about—"

Daniels glanced at the outside viewscreen, and was suddenly struck by something obvious, something he could never have overlooked, *except that his mind thought in terms of symbols, not realities.*

"Sir," said the sergeant urgently.

Daniels gripped the controls sav-

agely, and set the ship swooping to the north, and *down*, toward the frozen planet.

The communications officer blurted, "You *can't* set down! They'll get us anywhere down there!"

"He's going after the Ghisrans!" shouted the sergeant. "Sir, you can't get enough of them to count! Beyond the river, they'll take cover in trenches and gullies. On this side, you'll burn the Gurt, too!"

As if to demonstrate the sergeant's warning, the thick clots and masses of troops across the river dispersed, to vanish into numerous trenches and bunkers.

"Sir," cried the sergeant, "you'll never get them. There isn't fuel enough to—"

Daniels centered the ship directly over the river, eased off slightly on the gravitors, and balanced on the rockets.

Whirling clouds of steam and ice-crystals enveloped the ship. The glare from the screen grew dazzling. Then the ice abruptly seemed to turn black, and clouds of fog boiled up.

The communications officer stared.

The sergeant swore in sudden admiration.

Daniels guided the ship steadily down-river, on and on, leaving behind a strip of water that trailed clouds of fog in the moonlight. Then he cut the gravitors in strongly, rose to pass over the Gurt lines, and hovered briefly to look back.

The viewscreen showed the Ghisran troops on the near side of the river, inside a rough arc of Gurt soldiers, with the flowing river at their back. On the far side, the cut-off reinforcements cautiously rose from cover, to find deep water in front of them.

Suddenly perceiving what had happened, knots of Gurt troops began to run forward. Outnumbered by the Ghisrans as a whole, they in turn outnumbered the enemy on the near side of the river.

"They're cut off!" said the communications officer. "By the time it freezes again, they'll be finished. And they won't dare push across there next time, because, *the same thing may happen again!*"

The doctor stared from Daniels to the screen, and vigorously mopped his brow.

Daniels set the ship down gently, well behind the Gurt lines that were now moving forward.

A mental voice repeated to him another piece of the message:

"Because of the inaccuracy of symbols, an apparently hopeless situation may contain an unseen solution."

In his mind, Daniels had seen the ship only as a means of *escape*. Only at the last moment, had it dawned on him that the ship was incidentally an enormous torch.

Daniels drew a long shuddering breath, and silently thanked God.

Then he looked around the control room, with its delicate instru-

ments and complex controls, and abruptly another thought occurred to him.

Mentally, he spoke to whatever it was that under stress had found the solution:

“Don’t go away. There’s another little problem coming along.”

Across the control room, nicely shaped in the slacks and sweater, eyes blinking with incipient hysteria, and surrounded by a general air of solid unreason, their lone female

passenger struggled weakly to sit up. The sergeant relievedly wiped his brow, and felt around for some place to sit down.

The communications officer leaned back and relaxed.

The doctor let his breath out in a sigh and slumped in relief. “That’s it. It’s all over.”

Daniels got up from the control seat and braced himself to move fast.

Robyn screamed. ■

THE ANALYTICAL LABORATORY

My brief explanation of the voting system for stories in An. Lab. seems to have stimulated considerable voting; the total number of votes has almost doubled! Hooray! Shall we try for redoubling?

MAY 1966

PLACE	STORY	AUTHOR	POINTS
1.	The Alchemist	<i>Charles L. Harness</i>	2.17
2.	Call Him Lord	<i>Gordon R. Dickson</i>	2.72
3.	Under the Wide and Starry Sky	<i>Joe Poyer</i>	3.13
4.	The Wings of a Bat	<i>Paul Ash</i>	3.27
5.	Two-Way Communication	<i>Christopher Anvil</i>	3.42

JUNE 1966

1.	Stranglehold	<i>Christopher Anvil</i>	1.61
2.	The Ancient Gods (Pt. 1)	<i>Poul Anderson</i>	1.73
3.	CWAAC Strikes Again	<i>Hank Dempsey</i>	1.83
4.	Escape Felicity	<i>Frank Herbert</i>	1.95
5.	Early Warning	<i>Robert S. Scott</i>	2.08

THE EDITOR





Too Many Magicians

RANDALL GARRETT



Part Two of Four Parts.

*In any culture whether based on magic—
as Lord Darcy's was—or on science—as ours is—
the unexpected other side of things is inevitably the
most baffling. At a Magicians and
Sorcerers Convention what could be more baffling
than a non-magical murder.*

Illustrated by John Schoenherr

Synopsis

LORD DARCY, Chief Investigator for His Royal Highness, Prince Richard, Duke of Normandy, has found himself faced with a problem which involves more than murder—more, even, than espionage and international politics. His friend and assistant, **SEAN O LOCHLAINN**, Master Sorcerer and Chief Forensic Sorcerer for the Duchy of Normandy, has been locked up in the Tower of London on suspicion of murder.

On the morning of Tuesday, October 25, 1966, a certain **GEORGES BARBOUR** was stabbed to death in his room, in a cheap Cherbourg rooming house, by an unknown assailant. The first man to see the body was **COMMANDER LORD ASHLEY**, a special agent of the Imperial Naval Intelligence Corps. He reported discovering the body to the local Armsmen and to his superior at Cherbourg Naval Base. **BARBOUR**, it seems, was a double agent,

ostensibly working for Casimir IX, King of the Polish Hegemony, but actually reporting to the head of Continental Intelligence for the Anglo-French Empire—a man known only as Zed.

Because of the importance of the crime, the Chief Master-at-Arms of the Cherbourg Armsmen and the Lord Admiral in charge of Cherbourg Naval Base agreed to call in **LORD DARCY** to investigate the crime. **LORD DARCY** was contacted in Rouen via teleson and, since **COMMANDER LORD ASHLEY** had to make the trip across the Channel to carry information to the Chief of Naval Intelligence in London, **LORD DARCY** asked him to carry a message to **MASTER SEAN**, who was in London attending the Triennial Sorcerers Convention at the Royal Steward Arms.

The history of this world is different from that of our own. Instead of dying from the infection caused

by a crossbow bolt at the Siege of Chaluz in 1199, King Richard the Lion-Hearted survived to rule for another twenty years. Furthermore, the bout with fever had wrought a personality change which made him settle down to become a wise and good ruler. Therefore, when he died, in 1219, he was succeeded, not by the infamous Prince John, but by his nephew, Arthur, Duke of Brittany, who, at the age of thirty-three, took over an Empire that included England, Ireland, Scotland, and more than half of France. He has gone down in history as Good King Arthur, and is often confused, in the popular mind, with Arthur Pendragon, the British King who founded the Round Table six centuries before.

Since then, the House of Plantagenet has ruled the Anglo-French Empire, which by now includes not only the original Angevin inheritance but also the rest of France and the New World. The northern continent of the New World is called New England; the southern, New France.

Late in the Thirteenth Century, a brilliant monk discovered and formulated the Laws of Magic. Thus, thaumaturgical science, rather than physical science, has become the guiding field of knowledge of LORD DARCY's world.

The next morning, Wednesday, October 26th, MASTER SEAN had an appointment at the Royal Steward with MASTER SIR JAMES

ZWINGE, Chief Forensic Sorcerer for the City of London. After brief conversations with SIR LYON GANDOLPHUS GREY, Grand Master of the Sorcerers Guild, LORD JOHN QUETZAL, a journeyman sorcerer from the Duchy of Mechicoe, and MASTER EWEN MACALISTER, an oily and obnoxious specimen, MASTER SEAN went to keep his appointment. At exactly 9:30 a.m., MASTER SEAN rapped softly on MASTER SIR JAMES' door. Inside, he heard SIR JAMES' voice scream "Master Sean! Help!"—followed by the thud of a falling body. The door was locked. Help was sent for, and by chance LORD BONTRIOMPHE, Chief Investigator for the City of London, was on hand.

BONTRIOMPHE took an ax and cut through the door. MASTER SIR JAMES was found lying near the center of the room in a fresh pool of his own blood. There was no one else in the room. SIR JAMES' own knife and a large brass key which was the only one capable of unlocking the door were found near the body. Investigation has shown that there is no way in or out of the room. It is a sealed-room murder in the classical sense. The obvious conclusion is that the killing was done by Black Magic, and MASTER SEAN, who was known to have quarreled with SIR JAMES on the previous day, is the obvious suspect.

COMMANDER LORD ASH-

LEY, who was with LORD BONTRIOMPHE at the time MASTER SIR JAMES died, delivered LORD DARCY's message to MASTER SEAN—which instructed MASTER SEAN to come to Cherbourg immediately to help solve the BARBOUR killing—and then went directly to the Admiralty Building to report to his superior. The message was of little use to MASTER SEAN; he was taken into custody and put in a comfortable cell in the Tower of London.

LORD DARCY, notified of this development by his cousin, the MARQUIS OF LONDON, is in London by that evening. He goes directly to the Palace du Marquis where he finds the MARQUIS and LORD BONTRIOMPHE waiting for him.

The MARQUIS is a huge man—an inch or so shorter than LORD DARCY but weighing some two hundred eighty pounds. His own brilliance as a deductive logician is on a par with LORD DARCY's, but he is lazy and rarely uses his deductive faculties unless forced to do so. LORD BONTRIOMPHE, while a competent investigator, has by no means the genius of the other two men. LORD DARCY realizes that the MARQUIS is using MASTER SEAN as a lever to force LORD DARCY to solve the case, thereby saving himself the trouble of having to do so—and, incidentally, saving himself having to pay LORD DARCY's salary, since DARCY will be

forced to solve the murder on his own time in order to get MASTER SEAN out of the Tower.

DARCY goes to the Tower of London to see MASTER SEAN. The tubby little Irish sorcerer has already, by magical means, retrieved his carpetbag of thaumaturgical tools and could at any time leave the Tower, but he is staying put in the sure knowledge that LORD DARCY will get him out legally.

When LORD DARCY prepares to leave the Tower he sees that a dense fog has covered the City. The Warder at the gate is starting to call a cab for LORD DARCY when a carriage bearing the arms of the Duchy of Cumberland pulls into the courtyard. Inside it is an old friend, MARY, DOWAGER DUCHESS OF CUMBERLAND, a beautiful woman somewhat younger than LORD DARCY. She is also a journeyman sorceress. She offers LORD DARCY transportation.

As the carriage moves through the fog-shrouded streets of London, she tells LORD DARCY that she has information for him concerning the murder of MASTER SIR JAMES ZWINGE.

Her room at the Royal Steward is directly across the hall from SIR JAMES' room. At ten minutes of eight that morning she had seen a small, very beautiful girl, wearing the dress of an apprentice sorceress, leaving SIR JAMES' room after what seemed to be a heated argu-

ment. *MARY DE CUMBERLAND* had thought nothing of it until after *MASTER SEAN* was arrested. She had then made a determined effort to discover the girl's identity. The girl, she found, was a *DEMOISELLE TIA EINZIG*, who had been born within the borders of the Polish Hegemony. Not long ago she had left her home and spent some time in northern Italy, and finally had come to the Duchy of Dauphine in the Anglo-French Empire. But the Italians were seeking her on a criminal charge and she had barely escaped extradition.

"Extradition?" *LORD DARCY* asks the *DOWAGER DUCHESS*, "and what were the charges?"

"Black Magic!"

VI

Carlyle House has been the property of the Dukes of Cumberland since it was built, although it is frequently and erroneously supposed that it is a part of the heritage of the Marquisate of Carlisle by those who do not recognize that the names are similar in pronunciation but not in spelling.

Mary, Dowager Duchess of Cumberland—formerly Duchess Consort, née Lady Mary de Beaufort—had been the second wife of the widowed Duke of Cumberland. The Duke, at the time of the marriage, was in his sixties, Lady Mary in her early twenties. But no one who knew them had thought of it as

a May-December marriage, not even the Duke's son and heir by his late first wife. The old Duke, though only remotely related to the Royal Family, had the typically Plantagenet vigor, handsomeness, and longevity. His golden blond hair had lightened over the years, and his face had begun to show the deepening lines of age, but he was still as good as any man twenty years his junior, and he looked and behaved no older. But even a strong and powerful man may have an accident with a horse, and His late Grace was no exception.

Mary, who had loved her husband, not only for his youthful vigor but for his mature wisdom, was a widow before she was thirty.

Her stepson, Edwin—who, upon the death of his father, followed by His Majesty's confirmation, had become the present Duke of Cumberland—was rather a dull fellow. He was perfectly competent as an Imperial Governor, but he lacked the Plantagenet spark—however diluted—that his father had had. He liked and respected his stepmother—who was only six months his junior—but he did not understand her. Her vivaciousness, her quickness of mind, and especially her touch of the Talent, made her alien to him.

An agreement had been reached. De Cumberland would take care of the duchy, remaining in Carlisle; his stepmother would be given Carlyle House for life. It was all His Grace could do for a stepmother he loved

but did not in the least understand.

When Lord Darcy and the Duchess entered the front door of Carlyle House, the seneschal who held it open for them murmured, "Good evening, Your Grace, your lordship," and closed the door quickly to block out the gray tendrils of fog that seemed to want to follow them into the brightly lit hall.

"Good evening, Geffri," said Her Grace, turning so that the seneschal could help her off with her cloak. "Where is everyone?"

"My lords the Bishops of Winchester and Carlisle have retired, Your Grace. The Benedictine Fathers have gone to St. Paul's to chant Evensong with the Chapter; they were so good as to inform me that because of the fog they will spend the night at the Chapter House with their brethren. Sir Lyon Grey is remaining at his room in the Royal Steward tonight. Master Sean O Lochlainn has sent word that he is temporarily indisposed."

"Indisposed!" The Duchess laughed. "I should think so! He will spend the night in the Tower of London, Geffri."

"So I have been informed, Your Grace," said the imperturbable seneschal. "Sir Thomas Leseaux," he continued, taking Lord Darcy's cloak, "is in the salon. My Lord John Quetzal is upstairs donning his evening attire and should be down shortly. The selection of hot dishes which Your Grace ordered has been placed upon the buffet."

"Thank you, Geffri. Oh . . . I have sent the coach to the Palace du Marquis to fetch Lord Darcy's luggage. Let's see . . . where can we put my lord?"

"I should suggest the Lily Suite, Your Grace. It adjoins the Rose Suite and has a communicating door, making it suitable for the transfer thence of Master Sean's things, if that will be suitable and convenient for his lordship."

"Perfect, Geffri," said Lord Darcy. "When my things have been taken up, let me know, will you? I have not had an opportunity to freshen up since I arrived."

"I shall see that your lordship is notified immediately."

"Very good. Thank you, Geffri."

"A pleasure, your lordship."

"Come, my lord," said the Duchess, taking his arm, "we'll go in and have a drink with Sir Thomas to take the chill of the fog out of our bones."

As the two of them walked toward the salon, Lord Darcy said: "Who are your Benedictine guests?"

"The older one is a Father Quinn, from the north of Ireland."

"Father Quinn?" Lord Darcy said musingly. "I don't believe I know him. Who is the other?"

"A Father Patrique of Cherbourg," said Her Grace. "A remarkable Sensitive and Healer. You must meet him."

"Father Patrique and I have already met," said Lord Darcy, "and

I must say I agree with your evaluation. It will be a pleasure to see him again."

They went into the large, high-ceilinged room which served as both salon and dining room. At the far end of the salon, in a large easy chair, his feet outstretched to the warmth of the blaze in the great fireplace, his hand holding a partly-filled goblet, sat a tall, lean man with pale features and with light brown hair brushed straight back from a broad, high forehead.

He rose to his feet as soon as he saw his hostess and Lord Darcy approaching.

"Good evening, Your Grace. Lord Darcy! How good to see you again!" His engaging smile seemed to make his blue-gray eyes sparkle.

Lord Darcy took his outstretched hand. "Good to see *you* again, Sir Thomas! You're looking as fit as ever."

"For a scholar, you mean," said Sir Thomas with a chuckle. "Here! May I be so bold as to offer you both a splash of our gracious hostess' excellent brandy?"

"Indeed you may, Sir Thomas," said the Duchess with a smile. "I feel as though I had fog in every vertebra."

Sir Thomas went to the sideboard and extracted the glass stopple from the brandy decanter with lean, agile fingers. As he poured the clear, red-brown liquid into two thin-walled brandy goblets, he said: "I was fairly certain you would be

here as soon as I heard of Master Sean's arrest, but I hardly expected you so soon."

A trace of irony came into Lord Darcy's smile. "My Lord de London was good enough to send a special messenger across the Channel to relay the news, and I was able to make good train and boat connections."

Sir Thomas handed each of the others a goblet of brandy. "Is it your intention to put your brilliant brain to work to solve this murder in order to clear Master Sean?"

Lord Darcy laughed. "Far from it. My Lord Marquis would like me to do just that, but I shan't oblige him. The case is interesting, of course, but my duty lies in Normandy. Just between the three of us—and I ask you to let it go no further until after tomorrow—I intend to get Master Sean out by presenting my cousin de London with a dilemma. For that purpose, I have gathered enough facts to force him to release Master Sean. Then the two of us shall return to Normandy."

Mary de Cumberland looked at him with an expression that was both hurt and astonished. "You're returning and taking Master Sean with you? So soon? Shan't he be permitted to finish Convention Week?"

"I'm afraid not," Lord Darcy said. There was apology and contriteness in his manner and voice. "We have a murder of our own to

solve, Sean and I. I can't reveal details, and I admit that the case is neither as spectacular nor as . . . er . . . notorious as this one, but duty is duty. If the matter can be resolved quickly, of course, Master Sean may be back before the week is out."

"But what about the paper he was to present?" the Duchess persisted.

"If it is at all possible," Lord Darcy promised firmly, "I shall see that he gets back. If nothing else, I shall see to it that he gets back Saturday to deliver his paper. That, after all, is a part of his duty as a sorcerer."

"And you'll just hand the case right back to Lord Bontrionphe, eh?" asked Sir Thomas.

"I don't need to hand it back," said Lord Darcy with a chuckle, "since I did not accept it in the first place. It's all his, and I wish him luck. He and the Marquis are perfectly capable of its solution, have no fear of that."

"Without a forensic sorcerer to aid them?" Sir Thomas said.

"They'll manage," said Lord Darcy. "The late Sir James Zwinge was not the only capable forensic sorcerer in London. Besides, it is apparent that My Lord Marquis does not feel the need for a good forensic sorcerer. As soon as the second best one was killed, he proceeded to lock up the best one. Hardly the act of a man who was desperate for first-class thaumaturgical advice."

As the other two laughed quietly, Lord Darcy took a sip from his brandy goblet.

A door at the other end of the room opened.

"Good evening, Your Grace; good evening, gentlemen," said a warm baritone voice. "I'm terribly sorry. Have I interrupted anything?"

Lord Darcy, too, had turned to look. The newcomer was a handsome young man in crimson and gold evening dress whose distinctive features marked him as Mechicain. This, then, was Lord John Quetzal du Moqtessuma de Mechicoe.

"Not at all, my lord," said the Duchess, "we have been expecting you. Come in and permit me to introduce our new guest."

The introductions were made in due form, and Lord John Quetzal's heavy-lidded eyes brightened as Lord Darcy's name was spoken.

"It's a very great pleasure to meet you, my lord," he said, "though, of course, I deplore the circumstances that bring you here. I do not for a moment believe Master Sean guilty of this terrible crime."

"Thank you, my lord," Lord Darcy replied. "And I thank you for Master Sean, too." Then he added smoothly, "I did not realize that Master Sean's guilelessness was so transparently obvious that it would be utterly convincing upon such short acquaintance."

The Mechicain looked rather

self-conscious. "Well, it's not exactly that. Transparent? No, I shouldn't say that Master Sean is at all transparent. It's . . . er—" He hesitated in momentary confusion.

"My Lord John Quetzal's modesty does him credit," the Duchess cut in gently. "His is a Talent rare even among sorcerers. He is a witch-smeller."

"Indeed?" Lord Darcy looked at the young man with increased interest. "I confess that I have never met a sorcerer with that ability before. You can detect, then, the presence of a practitioner of black magic, even at a distance?"

Lord John Quetzal nodded. "Yes, my lord." He seemed embarrassed, like an adolescent lad who has just been told he is very handsome by a beautiful woman.

Sir Thomas chuckled. "Naturally, Lord Darcy, he would know immediately that Master Sean does not dabble in black magic. To a witch-smeller, that would be instantly apparent." He turned his smile toward Lord John Quetzal. "When we have some free time together, I should like to discuss theory with you and see how it actually squares with practical results."

"That . . . that would be an honor and a pleasure, Sir Thomas," said the young nobleman. There was an awestruck note in his voice. "But . . . but I'm very weak in symbological theory. My math isn't exactly my strong point."

Sir Thomas laughed. "Don't wor-

ry, my lord; I promise not to smother you in analogy equations. Good Heavens, that's *work!* When I am away from my library, I do everything I can to avoid any heavy thinking."

That, Lord Darcy knew, was not true; Sir Thomas was merely putting the young man at ease. Sir Thomas Leseaux, in spite of his degree of Doctor of Thaumaturgy, was not a practicing sorcerer. He did not possess the Talent to any marked degree. He was a theoretical thaumaturgist who worked with the higher and more esoteric forms of the subjective algebrae, leaving it to others to test his theories in practice. His brilliant mind was capable of grasping symbological relationships that an ordinary sorcerer could only dimly perceive. There were very few Th. D.'s who could follow his abstruse and complex symbolic analogies through to their final conclusions; most Masters of the Art bogged down hopelessly after the first few similarities. Sir Thomas had not been so lacking in awareness as to suppose a mere journeyman could follow his mathematics. On the other hand, he immensely enjoyed discussing the Art with practicing magicians.

"May I ask you a question, my lord?" Lord Darcy asked thoughtfully. "Even though I am not officially involved in the investigation of the murder of Sir James Zwinge, a man in my profession has a cer-

tain natural curiosity. I should like to ask you what might be considered a professional question, and"—he smiled—"if you like you may send me a bill for services rendered."

Lord John Quetzal returned the smile. "If the question requires that I invoke a spell, I shall most certainly bill you—at the usual journeyman's rates, of course. To do otherwise would impair my standing in the Guild. But if you merely want a professional opinion, I am at your service."

"Then I shall leave the matter in your hands," said Lord Darcy. "The question is: Have you detected the presence of a black magician amongst the members of the Convention?"

There was a sudden silence, as if time itself were suspended for a moment. Both Sir Thomas and the Duchess seemed to be holding their breaths, awaiting the young Mechicain nobleman's answer.

But from Lord John Quetzal there was only a moment of hesitancy. When he spoke, his voice was firm.

"My lord, it is my ambition to study forensic sorcery under the tutelage of a Master. I have, as a matter of course, studied both law enforcement and criminal detection. May I counter your question with one of my own?"

"Certainly," said Lord Darcy.

Lord John Quetzal compressed his lips for a moment in thought

before continuing. "Let us suppose that you personally knew, through the exercise of your own abilities, that a certain man was a criminal—that he had committed a particular crime. But let us further assume that, aside from your own personal knowledge, there was not one shred of proof whatever of the fact. My counter-question is: Would you denounce the man?"

"No," said Lord Darcy without hesitation. "Your point is well taken. It is nugatory to accuse a man without proof. But a word to the investigating officials, merely to give them a lead so they can discover proof if it exists, is certainly not a public accusation."

"Perhaps not," said the young sorcerer slowly. "I shall certainly take your words under advisement. But at the moment I feel that my unsupported word alone is not sufficient evidence even for that."

"That, of course, is your decision," the investigator said evenly. "But keep it in mind that if your Talent as a witch-smeller is widely known—if it is known, for instance, to someone whose very life might depend upon your silence—then I should advise you to be very careful that you are not silenced permanently."

Before Lord John Quetzal could answer, the door to the hall opened and Geffri appeared. "I trust you will pardon the intrusion, Your Grace, but I was instructed to notify his lordship as soon as his lord-

ship's luggage had been taken to the Lily Suite."

"Oh, yes; thank you, Geffri," said Lord Darcy.

"I believe I shall put on my evening clothes, too," said Her Grace. "Will you excuse me, gentlemen? And pray don't allow my absence to delay your own supper; help yourselves from the array on the buffet."

Fifteen minutes later, Lord Darcy, having bathed and shaved, was feeling more human than he had for hours. He took one last look at himself in the full-length mirror that hung on the bedroom wall of the Lily Suite. He made minor adjustments to the silver lace at his throat and wrists, flicked an almost microscopic bit of dust from the coral satin of his dress jacket, and decided he was ready to face the company in a better humor than when he had left them.

Downstairs, the door to the salon was open, and, as he approached it, Lord Darcy could hear Sir Thomas Leseaux's voice.

"The fact remains, my lord, that Sir James is, after all, dead."

"Couldn't it have been suicide, Sir Thomas?" asked Lord John Quetzal. "Or an accident?"

It was inevitable, Lord Darcy thought. Great and brilliant men and women, whose usual conversations were in the realm of ideas, would normally shun gossip or sporting events or even crime—ex-

cept in the abstract—as topics for an evening's discourse. But give them a murder—not a commonplace death in a public house brawl, nor a shooting in a robbery, nor a sordid killing in a fit of jealousy, nor an even more sordid sex crime, but an inexplicable death surrounded by mystery—give them a nice, juicy, puzzle of murder, and lo! they can speak of nothing else.

Sir Thomas Leseaux had said, less than half an hour ago, that he wanted to get Lord John Quetzal alone to discuss the theory of magic, with special emphasis on witch-smelling—and now he was saying:

"Accident or suicide? Why, as to that, I don't know, of course, but the authorities seem to be operating upon the assumption that it is murder."

"But why? I mean, what reason would anyone have for killing Master Sir James Zwinge? What is the motive?"

"A very good question," said Lord Darcy as he entered the salon. Only the two men were present. Obviously the Duchess had not yet finished dressing. "As a purely cerebral exercise, I have been pondering that question myself. But don't let me interrupt you. Pray continue your conversation whilst I sample the selection of goodies on the buffet table."

"Lord John Quetzal," said Sir Thomas, "seems to be at a loss for discovering a motive for the murder."

Lord Darcy looked at the row of copper bowls, each with its small alcohol flame flickering brightly beneath, and lifted the cover of the first. "Ah! Ham!" he said. "Very well, Sir Thomas. What about motive? Who might have wanted him dead?" He put a slice of ham on his plate and opened the next bowl.

Sir Thomas frowned. "No one that I know of," he said slowly. "He could be quite acerbic at times, but he would not willingly have harmed anyone, I think."

Darcy ladled some hot cherry sauce over his ham. "You know of no threats to kill him? No violent arguments with anyone?"

"Aside from his so-called argument with Master Sean, you mean? Yes, come to think of it, there was one such. Master Ewen MacAlister said some rather bitter things about him about a month ago. Master Ewen had made application to get on the Naval Research Staff, and Sir James—who had certain connections with Naval Research—recommended that Master Ewen's application not be approved."

"A revenge motive, then?" Lord Darcy poured himself a generous glass of claret and seated himself in a chair facing the other two, his tray on his lap. "I have never had the pleasure of meeting Master Ewen MacAlister, but from what Master Sean tells me, the pleasure would be doubtful. Is he the kind of man who would kill for revenge?"

"I . . . don't . . . know," said

Sir Thomas slowly. "I can imagine his killing someone to prevent that person from harming him, but I hesitate to say he would bother to do so after the harm was done."

Lord Darcy made a mental note to tell Lord Bontrionphe about that in the morning. It might be wise for Bontrionphe to make inquiries to find out whether Master Ewen had made or intended to make application for some other position that Sir James Zwinge had "certain connections" with.

"Anyone else?" Darcy asked, looking down at his plate.

"No," said Sir Thomas after a moment. "No one that I know of, my lord."

"Do you know a Demoiselle Tia Einzig?" Darcy asked in the same quiet tone of voice.

Sir Thomas' smile vanished. After several seconds, he said: "I know her, yes, my lord. Why?"

"She seems to have got herself charged with black magic. And it appears that Sir James was killed by black magic."

Sir Thomas' normally pale features darkened. "See here! You're not accusing Tia of this murder, are you?"

"Accuse? Not at all, Sir Thomas. I merely point out a possible connection."

"Well, there's nothing to it! Nothing, d'you understand! Tia is no more a witch than *you* are! I'll not have you making such insinuations, do you hear?"

"Do calm yourself, Sir Thomas," Darcy said mildly. "Relax. Get a grip on your emotions. Tell yourself a joke—or think of some refreshing equation."

The color in Sir Thomas' face subsided, but he did not smile at Lord Darcy's sally. "My deepest apologies, my lord. I . . . I hardly know what to say. I'm . . . I'm not myself. It's a . . . a touchy subject, my lord."

"Think nothing of it, Sir Thomas. I had no desire to upset you, but I am not at all offended. Murder is a touchy subject when it strikes as closely as this one has. Perhaps we had best discuss something else."

"No, no, please. Not on my account, I beg you."

"My dear Sir Thomas, I insist. All evening, I have been wanting to ask Lord John Quetzal questions about Mechicoe, and you have given me the perfect excuse for doing so. Murder is my business, but if I am not engaged in solving a given crime, discussing it begins to pall. So—

"My lord, if my memory of history has not betrayed me, the first Anglo-French ships touched the shores of Mechicoe in the year 1569, and the members of that expedition were the first Europeans your ancestors had ever seen. What was the cause of the superstitious awe with which the Europeans were regarded?"

"Ah! That's an interesting thing, my lord," the young man said with

enthusiasm. "First you must understand the legend or myth of Quetzalcoatl . . ."

The first few minutes were a bit awkward, but the young Mechicoe's enthusiasm was so genuine that both Sir Thomas and Lord Darcy were actually caught up in the discussion, and it was going full blast when the Dowager Duchess came down. An hour after that, all four of them were still discussing Mechicoe.

Lord Darcy did not get to bed until late, and he did not get to sleep until even later.

VII

Lord Darcy's resolve to keep his hands off the Zwinge case, to allow—or rather force—his cousin the Marquis of London to use his own resources to solve it, was a firm one. He had no intention of getting himself involved, even if that required that he bottle up his own intrinsic curiosity, seal the bottle, and sit on the cork. It was fortunate that he was not forced to do that, for Lord Darcy's curiosity was capable of generating a great deal of pressure. Any resolve, no matter how firm, can be dissipated, abolished, negated, removed, by changing circumstances, and the circumstances were to change drastically on the following morning.

On that morning, Thursday, Lord Darcy lay in his bed, drowsing, his mind still in a semi-dreamy state,

his thoughts wandering. There was a quiet knock on the door of his bedroom.

"Yes?" he said without opening his eyes.

"Your caffè, my lord, as you ordered," said a low voice.

"Just leave it in the sitting room," Lord Darcy said drowsily. "I shall be out in a few minutes."

But he wasn't. He drifted off to sleep again. He did not hear the bedroom door open; he did not hear the nearly silent footsteps that crossed the thick carpet from the door to his bed.

Suddenly, someone touched his shoulder. His eyes came open instantly, and he was wide awake.

"Mary!"

The Dowager Duchess curtsied. "Your servant, my lord. Shall I bring your caffè in, my lord?"

Lord Darcy sat up. "Ah! Capital! A Duchess for a serving wench! Indeed, yes! Bring the caffè in immediately! Hop to it, Your Grace!" He chuckled softly as the Duchess went out again, a soft smile on her lips. "And by the by!" he called after her, "will you have My Lord Marquis polish my boots?"

She came back in, pushing a wheeled serving cart upon which sat a silver caffè pot, a spoon, and a single caffè cup with saucer.

"Your boots are already polished, my lord," she said, still keeping her voice in the proper deferential tone. "I took the liberty, my lord, of having your lordship's cloth-

ing brushed and pressed, and hung in the clothes cupboard in the sitting room." She poured his caffè.

"Oh, indeed?" Lord Darcy said, reaching for his cup. "All done by a Bishop, I presume?"

"My Lord Bishop," said the Duchess, "had other, more pressing, business. However, His Imperial Majesty the King is prepared to take you for your morning drive."

Lord Darcy paused suddenly, the cup not yet touching his lips.

Bantering is all well enough, but one must draw the line somewhere.

One does not jest about His Most Sovereign Majesty the King.

And then Lord Darcy realized that his brain was not as completely awake as he had thought. He took a sip of the caffè and then returned the cup to its saucer before he spoke again.

"Who is His Majesty's agent?" he asked quietly.

"He's waiting in the hall. Shall I bring him in?"

"Yes. Wait! What o'clock is it, anyway?"

"Just on seven."

"Ask him to wait a minute or so. I'll dress. Fetch my clothes."

Seven minutes and some odd seconds later, Lord Darcy, fully dressed in proper morning costume, opened the door to his sitting room. Mary, Dowager Duchess of Cumberland, was nowhere in sight. A short, spare, melancholy-looking

man, wearing the usual blue-gray drab of a cabman, was sitting on one of the chairs. When he saw Lord Darcy, he came politely to his feet, his square cabman's hat in his hand.

"Lord Darcy?"

"The same. And you?"

From his cap, the smallish man took a silver badge engraved with the Royal Arms. Near the top a stone, polished but not faceted and looking like a quarter-inch bit of translucent gray glass, was inset in the metal.

"King's Messenger, my lord," said the man. He slid his right thumb forward and touched the stone. Immediately, it ceased to be a small lump of dull gray glass.

In the light, it gleamed with the reddish glow of a ruby!

There was no mistaking it. The stone was magically attuned to one man and one man only—the man whose touch would cause that red color to shine within it. A Royal Badge could be stolen, of course, but no thief could give that gray, drab stone its ruby glow.

The brilliant Sir Edward Elmer, Th.D., had designed that spell more than thirty years before; and no one had solved it yet; it was a perfect identification for Personal Agents of His Most Dread and Sovereign Majesty, John IV. The late Sir Edward had been Grand Master of the Sorcerers Guild, and it was accepted that he had outranked even Sir Lyon Gandolphus Grey as a sorcerer.

"Very well," said Lord Darcy. He did not ask the man's name; a King's Messenger remains anonymous. "The message?"

The Messenger bowed his head. "You are to accompany me, my lord. By His Majesty's request."

Lord Darcy frowned. "That's all?"

Again the Messenger bowed. "I have delivered His Majesty's message, my lord. I can say no more, my lord."

"I see. Will there be any objections if I come armed?"

A wide smile broke over the face of the King's Messenger. "If I may say so, my lord, it would be most expedient. His Majesty gave me a further message to your lordship, to be delivered only in case your lordship should ask that question. A message to be delivered in His Majesty's own words, my lord. If I may?"

"Proceed," said Lord Darcy.

Closing his eyes, the Messenger concentrated for a moment. When he spoke, the voice was cultured and clear; it had none of the patois of the Londoner of the lower middle class. The timbre and intonation had changed, too.

The voice was that of the King.

"My dear Darcy. The last time we met, you came armed. I should not expect a man of your caliber to break a precedent. The matter is most urgent. Come with all haste."

Lord Darcy suppressed a desire to bow low to the Messenger and

say: "Immediately, Sire." The Messenger was, after all, only an instrument. He was completely trustworthy, else he would not carry a Silver Badge; even his ordinary messages were to be honored. But when he delivered a message in His Majesty's Own Voice, even he, the Messenger, did not know what he said. When he murmured the key spell to himself, the message in the Royal Voice was delivered. The Messenger had no memory of it either before or after the delivery. He had submitted willingly to the recording of that message, and he had submitted willingly to its delivery and erasure. No sorcerer on Earth could pry that information out of him once it had been delivered, since, in his mind, it no longer existed.

Before it had been delivered, of course, it could be pried out, but not from a King's Messenger. Any attempt to get such a message from the mind of a King's Messenger without authority would result in the immediate death of the Messenger—a fact which the Messenger realized and accepted as a part of his duty to Sovereign and Empire.

After a moment, the King's Messenger opened his eyes. "All right, your lordship?"

"Perfectly, my good fellow. Are you a good cabman?"

"The best in London, my lord—though I say it who shouldn't."

"Excellent! We must go without delay!"

During the ride, Lord Darcy mused upon the King's words. When he had asked the Messenger whether or not he should go armed, it had been a simple question that any Officer of His Majesty's Peace might have asked. Lord Darcy had had no notion that the Messenger was actually taking him to the Royal Presence; he had asked about arming himself purely in the interests of his official duties. And now, as a result of a perfectly ordinary question, he found himself among the small handful of men who were permitted to be armed in the Royal Presence.

Traditionally, only the Great Lords of State were permitted to remain armed in the King's presence—and they only with swords.

In so far as he knew, Lord Darcy was the only person who, in all of history, had been given Royal permission—which amounted to a command—to appear before His Majesty armed with a gun. It was a singular, a unique, honor—and Lord Darcy was well aware of it.

But those thoughts did not distract his mind for long; of far more importance at the moment was the reason for the King's message. Why should His Majesty be personally interested in an affair which, although it had its outré elements, was, after all, a rather ordinary murder? At least, on the surface of it, it seemed to have no connection with Affairs of State. However . . .

Suddenly Lord Darcy smote his forehead with the palm of his hand. "Fool!" he muttered sharply to himself. "Dolt! Moron! Idiot! Cherbourg, of course!" This, he thought, is what comes of allowing one's emotions to be distracted by Master Sean's plight when one should have them under full control for analyzing the problem at hand. The thing was as plain as a pikestaff once a competent mind came to focus on it.

Therefore, Lord Darcy was not in the least surprised, after the cab had swept through the gates of Westminster Palace, past the armed guard who recognized the vehicle and driver immediately, to find that a Naval officer wearing the uniform of a Commander was waiting for him in the courtyard. In fact, the lack of such a person would indeed have surprised him.

The Commander opened the door of the cab, and, as Lord Darcy stepped out, the Commander said: "Lord Darcy? I am Commander Lord Ashley and your servant, my lord."

"And I yours, my lord," said Lord Darcy. "Your presence here, by the by, confirms my suspicions."

"Suspicions?" The Commander looked startled.

"That there is presumed to be a connection between the murder of a certain Georges Barbour in Cherbourg two days ago, and the murder of Master Sir James Zwinge yesterday in the Royal Steward. At least,

Naval Intelligence presumes a connection."

"We are almost certain there is a connection," said Lord Ashley. "Will you come this way? There is to be a meeting in Queen Anette's Parlor immediately. Just through this door, down the hall to the stairway and— But perhaps I am taking a liberty, my lord. Do you know your way about the Palace?"

"I have made it a point, my lord, to study the floor plans of the great palaces and castles of the Empire. Queen Anette's Parlor, where the Treaty of Kobenhavn was revised and signed in 1891, is directly above the Chapel of St. Edward the Confessor—consecrated in 1633, during the reign of Edward VII. Thus, it would be up this stairway, left turn, down the hall, through the Gascon Door, right turn, fifth door on the right, easily recognizable by the fact that it still bears the gilt-and-polychromed personal arms of Anette of Flanders, consort to Harold II." Lord Darcy gave Commander Lord Ashley a broad smile. "But to answer the question as you meant it: No, I have never been in Westminster Palace before."

The Commander smiled back. "Nor have I." He chuckled. "If I may say so, I find myself somewhat taken aback by this sudden soaring into a rather rarified atmosphere. Two men whom I had never met are done in—something which happens all too frequently in Intelligence work—and then, suddenly, what

seemed a rather routine killing is suddenly catapulted to the importance of an *Affair of State*." He lowered his voice a little. "His Majesty himself will attend the meeting." They went up the stairway and turned left, toward the Gascon Door.

"Tell me," Lord Darcy said, "have you any theory?"

"As to who killed them? Polish agents, of course," the Commander said. "But if you mean do I have any theory as to who the agents may be, then—no, I don't. Could be anyone, you know. Some little shop-keeper or tradesman or something of the sort, a perfectly ordinary appearing man, is one day told by his Polish superiors, 'Go to such-and-such a place, where you will find a man named thus-and-so. Kill him.' He does it, and an hour later is back at his regular business. No connection between him and the dead man. No motive that can be linked personally to the killer. No clue of any kind." They passed through the doorway and turned right.

"I trust," said Lord Darcy with a smile, "that your pessimism is not generally shared by the Naval Intelligence Corps."

"Well, as a matter of fact," said the Commander in a slightly apologetic tone, "I believe it is. If the killers can be found, so much the better, of course, but that will be merely a by-product of the real business, you see."

"Then the Navy feels that there is something more dangerous going on than murder?" The two men stopped before the door with the gilt-and-polychrome arms that marked Queen Anette's Parlor.

"Indeed we do. The King views it with greatest consternation. He'll give you any further information."

Lord Ashley opened the ornate door, and the two men went in.

VIII

The three men seated at the long table were immediately recognizable to Lord Darcy, although he had met only one of them before. Lord Bontrionphe was looking his usual calm, affable self.

The erect, silver-bearded old man with the piercing eyes and the magnificent blade of a nose could only be Sir Lyon Grey, in spite of the fact that he wore ordinary morning clothing instead of the formal pale-blue and silver of a Master Sorcerer.

The third man had a highly distinctive face. He appeared to be in his late forties or early fifties, although his dark, curly, slightly disarrayed hair showed only a few threads of gray, and then only when one looked closely. His forehead was high and craggy, giving his head a rather squared-off appearance; his eyes were heavy-lidded and deep-set beneath thick, bushy eyebrows; his nose was as large as Sir Lyon's, but instead of being thin and bladelike,

it was wide and slightly twisted, as though it had been broken at least once and allowed to heal without the services of a Healer. His mouth was wide and straight, and the moustache above it was thick and bushy, spreading out to either side like a cat's whiskers, each hair curling separately upwards at the end. His heavy beard was full, but was cut fairly short, and was as wiry and curly as his hair, moustache, and eyebrows.

At first glance, one got the impression of forbidding ruthlessness and remorseless purpose; it required a second, closer look to see that those qualities were modified by both wisdom and humor. It was the face of a man with tremendous inner power and the ability to control and use it both wisely and well.

Lord Darcy had heard the man described, and the uniform of royal blue heavily encrusted with gold merely clinched the identification of Peter de Valera ap Smith, Lord High Admiral of the Imperial Navy, Commander of the Combined Fleets, Knight Commander of the Order of the Golden Leopard, and Chief of Staff for Naval Operations.

A fourth man, standing near the Lord High Admiral, seemed about the same age, but his hair was noticeably gray, and his features were so commonplace that they paled into insignificance in comparison. Lord Darcy did not recognize him, but the uniform he wore was that of a Naval Captain, which suggested

that he was connected with Naval Intelligence.

When Commander Lord Ashley performed the necessary introductions, all of Lord Darcy's tentative identifications had proved correct, including the last; the man was Captain Percy Smollett, Chief of Naval Intelligence, European Branch.

Of the three Navy men, Lord Darcy noticed, only the Lord High Admiral wore his dress sword; he alone of the three was so permitted in the Royal Presence. Lord Darcy was suddenly intensely aware of the pistol on his right hip, concealed though it was by his morning coat.

Hardly had the introductions been completed when a door to an adjoining room opened suddenly, and a man wearing the livery of the Major Domo of the Royal Household entered.

"My lords and gentlemen!" he said firmly. "His Imperial Majesty the King!"

The six men were on their feet. As the King entered, they bowed low rather than genuflecting. This was a nice point of etiquette often misunderstood. His Majesty was dressed in the uniform of the Commander-in-Chief of the Imperial Navy. Had he worn full regalia or ordinary street clothes, a genuflection would have been in order; but in Army or Navy uniform he was wearing the *persona* of a military officer—an officer of the most exalted rank, true, but an officer,

nonetheless, and no military officer rates a genuflection.

"My lords and gentlemen, please be seated," said His Majesty.

John IV, by the Grace of God, King and Emperor of England, France, Scotland, Ireland, New England, and New France; Defender of the Faith, et cetera, was the perfect model of a Plantagenet King. Tall, broad of shoulder, blue of eyes, and blondly handsome, John of England was a direct descendant of Henry II, the first Plantagenet King, through Henry's grandson, King Arthur. Like his predecessors, King John IV showed all the strength, ability, and wisdom that was typical of the oldest ruling family in Europe. In no way but physically did he resemble the members of the wild, spendthrift, unstable cadet branch of the family—now fortunately extinct—which had descended from the youngest son of Henry II, the unhappy Prince John Lackland who had died in exile three years before the death of King Richard the Lion Hearted in 1219.

The King sat at the head of the table. To his left sat, in order, the Lord High Admiral, Captain Smollett, and Lord Bontrionphe. To his right were Sir Lyon, Commander Lord Ashley, and Lord Darcy.

"My lords, gentlemen, I think we all understand the reason for this meeting, but in order to get the facts straight in our minds, I will ask My Lord High Admiral to ex-

plain what we are up against. If you will, my lord."

"Certainly, Sire." My Lord High Admiral's voice was a faintly rasping baritone which, even when it was muted, sounded as though it should be bellowing orders from the quarterdeck instead of holding a quiet discussion at Westminster Palace. He looked round the table with his piercing seaman's gaze. "This concerns a weapon," he said bluntly. "That is, *I* call it a weapon. Sir Lyon doesn't. But I'm only a Navy man, not a sorcerer. We all know that sorcery has its limitations, eh? That's why magic can't be used in warfare; if a sorcerer uses magic to destroy an enemy ship, he has to use Black Magic, and no sane sorcerer wants to do that. Besides, Black Magic isn't that effective. The Polish Royal Navy tried to use it back in '39, and our counter-spells nullified it easily. We blasted 'em out of the water with cannon while they were trying to make their spells work. But, as I understand it, this is *not* Black Magic." He looked over at the Grand Master. "Perhaps you'd better explain, Sir Lyon."

"Very well, my lord," said the Master Sorcerer. "Perhaps, to begin with, I had best make it clear to you that the line between what we call 'Black' magic and what we call 'White' magic is not as clearly defined as many people suppose. We say, for instance, that the practice of the Healing Art is White Magic, and that the use of curses to cause illness

or death is Black Magic. But, one may ask, is it White Magic to cure a homicidal maniac of a broken leg so that he may go out and kill again? Or, contrariwise, is it Black Magic to curse that same maniac so that he dies and kills no more? Well, in both cases—yes. It can be so proven by the symbolical mathematics of the Theory of Ethics. I won't bore you with the analogy equations themselves; suffice it to say that, in such widely diverse cases, the Theory of Ethics is quite clear.

"This is summed up in the aphorism that every first-year apprentice sorcerer knows by heart: *Black Magic is a matter of symbolism and intent.*"

Sir Lyon smiled and turned his right palm up in a gesture of admission. "So, of course, is White Magic—but it is the Black against which we must warn."

"Quite understandable," said Captain Smollett.

"I shan't go into this further," said Sir Lyon, "except to say that the Theory of Ethics *does* allow one to *interfere* with the actions of another, when that other is bent upon destruction. As a result, we have perfected the . . . er . . . 'weapon' which my lord the High Admiral has mentioned." Sir Lyon glanced round the table again, his deep-set brilliant eyes looking at each man in turn. Then he bent over and took an object from beneath the table and placed it on the polished oaken surface for all to see.

"This is it, my lords and gentlemen."

It was an odd-looking device. The main bulk was a brass cylinder eight inches in diameter and eighteen inches long. This cylinder was mounted on a short tripod which held it horizontally four inches off the table top. On one end of the cylinder, there were two handles, fitted so that the cylinder could be aimed by gripping with both hands. From the other end there projected a smaller cylinder, some three inches in diameter and ten inches long. The last four inches flared out to a diameter of six inches, making a bell-like muzzle.

Lord Bontrionpne smiled. "That's a very oddly shaped gun, Sir Lyon."

The Grand Master chuckled dryly. "Your lordship perceives, of course, that the device is *not* a gun—but, in a way, the analogy is an apt one. I cannot demonstrate its operation here, of course, but the explanation of its operation—"

"One moment, Sir Lyon." The King's voice cut in smoothly.

"Sire?" The Grand Master Sorcerer's eyebrows lifted. He had not expected His Majesty to interrupt at that point.

"Can the device be operated against a single man?" His Majesty asked.

"Of course, Sire," said Sir Lyon. "But Your Majesty must understand that it works to inhibit only a single

type of operation, and we have not the facilities here to—”

“Bear with me, Sir Sorcerer,” said the King. “I think we *do* have the facilities you mention. Could you use Lord Darcy as your target?”

“I could, Sire,” said Sir Lyon a speculative gleam in his deep-set eyes.

“Excellent.” The King looked at Lord Darcy. “Would you consent to an experiment involving yourself, my lord?”

“Your Majesty has but to ask,” said Lord Darcy.

“Very good.” His Majesty held out his right hand. “Would you be so good as to give me the pistol you carry at your hip, my lord?”

It was as though a silent lightning bolt had struck every man at the table. Heads jerked round. Every eye focused in startled surprise on Lord Darcy’s face. The Lord High Admiral grasped the hilt of his narrow-bladed Naval dress sword and withdrew it half an inch from its scabbard.

The shock was obvious. How *dare* any man come into the King’s Sovereign Presence armed with a pistol?

“Peace, My Lord Admiral!” said the King. “My lord of Arcy comes armed by Our request and permission. Your pistol, Lord Darcy.”

Coolly, Lord Darcy performed an act that would have turned the stomach of every right-thinking man in the Empire. He drew a gun in the presence of His Dread and Sovereign Majesty the King.

Then he rose, leaned across the table, and presented the pistol to the King, butt first. “As Your Majesty bids,” he said calmly.

“Thank you, my lord. Ah! An excellent weapon! I have always considered the .40 caliber MacGregor to be the finest handgun yet built. Are you ready, Sir Lyon?”

Sir Lyon Grey had obviously already fathomed the King’s intentions. He smiled and swiveled the gleaming metal device around so that the bell-like muzzle pointed directly at Lord Darcy. “I am ready, Sire,” he said.

The King, meanwhile, had unloaded the MacGregor, taking all seven of the .40 caliber cartridges out and placing them on the table in front of him while five pairs of eyes watched him in fascination.

“My lord,” said the King, looking up, “I shall ask you to ignore what Sir Lyon is doing.”

“I understand, Sire,” said Lord Darcy.

“Excellent, my lord.” His Majesty’s eyes moved upwards, along the wall opposite. “Hm-m-m. Yes. My lord, I call your attention to the stained glass in yonder window—particularly to that area which depicts King Arthur holding the scroll, the scene which symbolizes the establishment of the Most Ancient and Noble Order of the Round Table.”

Lord Darcy looked at the window. “I see the section to which Your Majesty refers,” he said.

“Good. That window, my lord, is a

priceless work of art. Nonetheless, it offends me."

Lord Darcy looked back at the King. His Majesty pushed the unloaded pistol, and it slid across the polished surface to come to rest in front of Lord Darcy. Then he flipped a finger, and a single cartridge spun across the table to come to rest beside the gun. "I repeat, my lord," said the King, "that bit of glass offends me. Would you do me the favor of putting a bullet through it?"

"As you command, Sire," said Lord Darcy.

Had he not known that he was the subject of a scientific experiment, the scene that followed would have been one of the most humiliating in Lord Darcy's career. It was only afterwards that he realized that a single snicker or chuckle from any of the other six men at the table would have snapped his temper. For a man who normally had such magnificent control over his emotions, such an explosion of wrath would have been almost the final humiliation. But no one laughed, for which Lord Darcy was afterward deeply thankful.

The task was a simple one. Pick up the cartridge, place it in the chamber, close the lock, aim, and fire.

Lord Darcy reached for the pistol with his right hand and for the cartridge with his left. Somehow, he caught the handgun wrong, so that he gripped it upside down, with the muzzle facing him. At the same

time, his fingers closed on the cartridge wrong, so that it slipped from his grasp and skittered across the table. He reached out again, grabbed at it, and it slid away. Then, angry, he slammed his palm down on it and finally caught it.

Then there was a loud clatter. In focusing his attention on the cartridge, he had allowed the pistol to slip from the grasp of his other hand.

He set his teeth and clenched his left hand around the wayward cartridge. Then he reached out with great determination and picked up the pistol with his right hand. Fine.

Now to open the lock. His right thumb found the stud and pushed it, but his other fingers missed their grip at that point, and the gun was suddenly hanging from his forefinger, swinging by the trigger guard. He tried to swing it round so that he could grasp the butt but it slipped from his forefinger and banged to the table top again.

Lord Darcy took a deep breath. Then, with calm deliberation, he reached out and picked up the gun. This time, he used his left thumb to open the lock, but in doing so he dropped the cartridge again.

The next few minutes were a nightmare. The cartridge persisted in slipping from his grasp when he tried to pick it up, and when he did manage to pick it up it refused to go into the chamber. And just as it seemed about to slide in properly, he would drop the gun again.

Lord Darcy set his teeth; the muscles in the sides of his jaw stood out in hard relief. Moving his hands slowly and carefully, he finally managed—after many fumbles, slips, and errors—to get the cartridge into the chamber and close the lock.

His feeling of relief at having achieved this was so great that his fingers relaxed and the gun fell to the table again. Angry, he reached out, snatched it up, aimed in the general direction of the window, and—

The gun went off with a crash, long before he had intended it to.

King Arthur and his scroll remained serenely undamaged while the slug slammed into the stone wall two feet away, chipping off a large flake of stone and ricocheting up to the ceiling, where it buried itself in an oak beam.

After what seemed like an interminably long silence, Sir Lyon Gandolphus Grey said softly: "Magnificent! Your Majesty, in all our tests, no one has ever managed to load the gun, much less come that close to hitting the target. We are fortunate in knowing that we shall not find many minds so superbly disciplined—especially in the ranks of the Polish Royal Navy."

His Majesty spun the remaining six cartridges down the table. "Reload and reholster your weapon, my lord. Please accept my apologies for any . . . ah . . . inconveniences this experiment may have caused."

"Not at all, Sire. It has been a most educational experience." He

scooped up the six cartridges and reloaded his MacGregor with expert ease. Although the belled muzzle of the device was still pointed in his direction, Sir Lyon's hands were no longer upon the grips.

"I congratulate you, my lord," said the King. "All of us here, with the exception of Lord Bontrionphe and yourself, have seen this device in operation before. As Sir Lyon says, you are the first ever to succeed in loading a weapon while under its spell." Then he looked at Sir Lyon. "Have you anything further to add, Sir Sorcerer?"

"Nothing, Sire . . . unless there are any questions."

Lord Bontrionphe raised a hand. "One question, Sir Lyon."

"Certainly, my lord."

Lord Bontrionphe gestured toward the device. "Is this gadget one that can be operated by anyone—by any layman, I mean—or does it require a sorcerer as operator?"

Sir Lyon smiled. "Fortunately, my lord, the device cannot be operated by one without a trained Talent. It does not, however, require the services of a Master; an apprentice of three years standing can operate the device."

"Then, Sir Lyon," said Lord Darcy, cutting off whatever it was that Lord Bontrionphe had to say, "the secret of its operation is divided into two parts. Am I correct?"

"My lord," said Sir Lyon after a moment, "your lack of the Talent is a great loss to the Sorcerers Guild.

As you have correctly deduced, there are two parts to the spell. The first—and most important—part is built into this device here.” He pointed toward the golden-gleaming brass instrument. “The symbolism built into this . . . er . . . ‘gadget’ I think you called it, Lord Bontrionphe—is most important. Within this brass cylinder are the invariables—what we call the ‘hardware’ of the spell. But this, by itself, is of no use. It can only be used by a sorcerer who can use the proper verbal spells to activate it. These spells we call the ‘software’—if you follow me, my lord.”

Lord Bontrionphe nodded, grinning. “Between the two of you,” he said, “you and Lord Darcy have answered my question. Do proceed, Sir Lyon.”

“I think there is no need to,” said Sir Lyon. “I shall turn the rest of the discussion over to the Lord High Admiral.”

“I think we can all see,” said the Lord High Admiral without waiting for Sir Lyon to sit down, “what this device could do to an enemy ship in the hands of a sorcerer who knew the spells. It does not prevent them from steering the ship—that, as I understand it, would be Black Magic—but any attempt to load and fire their batteries would result in chaos. We have seen what happens when *one* man attempts it. You should see what it does to a *team*! Each man is not only fumbling his own job, but is

continually getting in the way of others. As I said—chaos.

“With this device, my lords and gentlemen, the Imperial Navy can keep the Slavonic Royal Navy bottled up in the Baltic for as long as necessary. Provided, of course, that *we* have it and *they* don’t.

“And that, sirs, is the crux of our problem. The secret of this device must not be allowed to fall into Polish hands!”

The crux indeed! thought Lord Darcy, suppressing a smile of satisfaction. The King had already taken out his pipe and was filling it; Lord Darcy, the Lord High Admiral, and Captain Smollett had immediately reached for their own smoking equipment. But Lord Darcy was watching Captain Smollett. He could have predicted almost to the word what the Lord High Admiral’s next words would be.

“We are faced, then,” said my lord the High Admiral, “with a problem of espionage. Captain Smollett, the details, if you please.”

“Aye, aye, my lord.” The Chief of Naval Intelligence puffed solemnly on his pipe for a second. Then: “Problem’s very simple, m’luds. Answer’s difficult. Someone’s been tryin’ to sell the secret of this device to the Poles, d’you see. Here’s what’s happened:

“We had a double agent in Cherbourg—name’s Barbour, Georges Barbour. Not Anglo-French, actually. Pole. Did damn’ good work for us, though. Trustworthiness high.”

Smollett took his pipe from his mouth and gestured with the stem. "Now"—he stabbed the air with the pipestem—"a few weeks ago, Barbour got a letter—anonymous, untraceable—saying that the secret of the device was for sale. Description of exterior and of effect of device quite accurate, you understand, m'luds. Very well. Barbour contacted his superior—chap known to him only by code name 'Zed'—and asked for instructions. Zed came to me; I went to My Lord High Admiral. Amongst the three of us, we set a trap."

"Your pardon, Captain Smollett," said Lord Darcy, taking advantage of a pause in the captain's narrative.

"Certainly, m'lud."

"No one knew of this trap save yourself, my lord the High Admiral, and Zed?"

"No one, m'lud," Captain Smollett said emphatically. "Absolutely no one."

"Thank you. Pardon the interruption, Captain."

"Certainly, m'lud. At any rate." He took a puff from his pipe. "At any rate, we set it up. Barbour was to make further contact. Asking price for details of secret—five thousand golden sovereigns."

And worth it, too, Lord Darcy thought to himself. One golden sovereign was worth fifty silver sovereigns, and a "twelfth-bit"—one twelfth of a silver sovereign—would buy a cup of caffè in a public house. One can buy an awesome amount of

caffè for a quarter of a million silver sovereigns.

"Negotiations took time," Captain Smollett continued. "Barbour couldn't appear too eager. Look suspicious, eh? Yes. Well, 't'any rate, negotiations went on. Barbour, you must understand, was not working through Intelligence in Cherbourg. Worked through Zed. Had to be careful of contacts with us, you see. Always watched by Polish agents in Cherbourg." Captain Smollett gave a short, sharp, barking laugh. "While we watched Poles, of course. Devilish job."

"Didn't dare break Barbour's cover, d'you see; too damn' valuable a man. Now—during the negotiations, the man who was trying to sell the secret came twice to see Barbour. Barbour described him. Black hair, black beard and moustache, straight nose, fairly tall. Wore bluetinted glasses, spoke with a hoarse, whispery voice in a Provence accent. Fairly tall. Dressed like a member of the well-to-do merchant class."

Lord Darcy caught Lord Bontriomphe's eyes, and the two investigators exchanged quick grins. The description was such that neither of the two men needed Captain Smollett's next statement.

"Obviously a disguise," said Captain Smollett.

"A question, Captain," said Lord Bontriomphe.

"Yes, m'lud?"

"This bloke made two appointments with Barbour. Since you must

have known about 'em beforehand, why didn't you grab him then—when he kept the appointments?"

"Couldn't, m'lud," Captain Smollett said firmly. "Not without breaking Barbour's cover. Too many Polish agents in Cherbourg keeping an eye on Barbour. *They* knew Barbour was dealing with this chap—called himself Goodman FitzJean, by the way. Any attempt to grab FitzJean would have meant that we'd've had to grab Barbour, too, d'you see. If

we didn't, the Polish agents would've known that we knew about Barbour. *Not*, p'raps, that he was a double agent, but—at least—that we knew of 'im, eh? Would've broken his cover, rendered him useless to His Slavonic Majesty. Couldn't afford that, d'you see."

"You could have had this FitzJean followed after the appointments," Lord Bontrionphe pointed out.

"We *did*, m'lud," the captain said with some acerbity. "Natu-



rally. Both times." Captain Smollett frowned in chagrin. "Unfortunately, I am forced to admit that the man eluded our agents both times." He took a deep breath. "Our Goodman FitzJean, m'luds and gentlemen, is no amateur." He looked around at each of the others. "Damn' sharp man. Don't know whether he knew he was being followed or not. But he likely suspected Polish agents following him, even if he didn't suspect Imperial agents. Managed to get away both times, and I make no apologies, m'luds."

Captain Smollett paused to take a breath, and the Lord High Admiral cut in—this time addressing His Majesty.

"With your permission, Sire, I stand behind Captain Smollett. No agent or group of agents can follow a suspect for very long if the suspect is aware that he is being followed and is trained in evasion techniques."

"I am aware of that, my lord," said King John calmly. "Please continue, Captain Smollett."

"Yes, Sire," said the captain. He cleared his throat. "As I was saying, m'luds, we failed to follow the so-called FitzJean. But Barbour had—with our connivance—baited the trap. He agreed, d'you see, that the information FitzJean had was worth the five thousand golden sovereigns. He told FitzJean that His Slavonic Majesty's Government had agreed to the price. *Provided . . .*" Captain

Smollett gestured vaguely with his pipe, and cleared his throat again.

"*Provided . . .* ahum . . . that he prove to Barbour that he—FitzJean, that is—prove that he was a person who had access to the secret."

Captain Smollett put his pipe back in his mouth and surveyed the others with his eyes. "I trust you follow, m'luds," he said, clenching the pipe in his molars and speaking round it. "FitzJean wouldn't divulge the plans of the device without cash in hand. But how were the Polish agents to know that the secret was worth anything? Eh?"

Captain Smollett held up a finger. "*That*, m'luds, is what our double agent Barbour told FitzJean. Not the truth, of course. Barbour had to give a cover story to His Slavonic Majesty's agents. Told them, as a matter of fact, that he had contacted an Imperial Naval officer who was willing to give him the plans for the deployment of Imperial and Scandinavian ships in the North Sea and the Baltic. Price, according to what Barbour told his Polish superiors, was two hundred golden sovereigns." Captain Smollett spread his hands in a gesture of disgust. "Most they'd pay, of course, since fleet deployment can be changed rather quickly. But still useful.

"Evidently, the Poles agreed. But they wouldn't pay until they'd received the information. On the other hand, FitzJean demanded a hundred gold sovereigns just to prove that he was in earnest.

"We agreed. Barbour was to pretend that the money was coming from Poland. Said that, upon proof of FitzJean's bona fides, he'd give FitzJean a hundred sovereigns and then get the other forty-nine hundred and pay them when the details of the secret were delivered. Trouble was, FitzJean wouldn't make a definite appointment. Clever of him, you know. Kept Barbour on tenterhooks, as it were. D'you follow, m'luds?"

"I follow," said Lord Bontriomphe. "This FitzJean was actually trapped into giving away his identity for five thousand silver sovereigns. Right? But he didn't do so, did he? That is, your organization never paid the hundred gold sovereigns, did they?"

"No, m'lud," said Captain Smollett. "The hundred sovereigns were never paid." He looked across the table. "Explain, Commander," he said to Lord Ashley.

Commander Lord Ashley nodded. "Aye, sir." He looked at Lord Darcy, then at Lord Bontriomphe. "I was supposed to bring the money to him yesterday morning. He was dead when I arrived; stabbed only minutes before, evidently."

He went on to explain exactly what he had done and what had followed, including the conversation with Chief Henri and Lord Admiral Brencourt in Cherbourg.

Lord Bontriomphe listened without asking questions until the commander's narrative was finished;

then he looked at the Lord High Admiral and waited expectantly.

"Huhum!" The Lord High Admiral gave a rumbling chuckle. "Yes, my lords. The connection, of course. It was this: Sir James Zwinge, Master Sorcerer and Chief Forensic Sorcerer for the City of London, was also the head of our counterespionage branch—operating under the code name of 'Zed.'"

IX

"And now," said Lord Darcy an hour later, "I am prepared to make an arrest for the murder of Master Sir James Zwinge."

My lord the Marquis of London remained all but motionless behind his desk. Only the slight narrowing of his eyes gave any indication that he had heard what the Chief Investigator of Normandy had said.

Lord Darcy and Lord Bontriomphe had returned to de London's office immediately after His Majesty had dismissed the meeting at Westminster Palace. Lord Darcy could still hear the King's last orders: "Then we are agreed, my lords. Our civilian investigators will proceed to investigate these murders as though they were in no way connected with the Navy, as though they were merely seeking a murderer. No connection must be made between the killing of Barbour and the killing of Sir James, as far as the public is concerned. Meanwhile, the Naval Intelligence Corps will be working to un-

cover the other contacts of Barbour, and make a minute investigation of the reports he filed with 'Zed' and the reports 'Zed' filed with the London office. There may be more evidence than we realize in those report files. Finally, we must all do our best to see that His Slavonic Majesty's secret agents remain at least as much in the dark as we are."

For a moment, Lord Darcy had thought that last bit of heavy sarcasm from the King had made Lord High Admiral Peter de Valera ap Smith angry. Then he had realized that the Lord High Admiral's choked expression came from a valiant and successful attempt to smother a laugh.

By Heaven, Lord Darcy had thought, I must get to know that old pirate better.

My Lord of London had been seated behind his desk reading a book when Lord Darcy and Lord Bontrionpne had entered the office. The Marquis had picked up a thin golden bookmark, put it carefully between the pages of the book, closed the book and placed it on the desktop before him. "Good morning, my lords," he had rumbled, inclining his head perhaps an eighth of an inch. "There is a letter for you, Lord Darcy." He had pushed a white envelope across the desk with a fat forefinger. "Delivered this morning by special courier."

"Thank you," Lord Darcy had murmured politely, picking up the envelope. He had broken the seal,

read the three sheets of closely written paper, refolded them, replaced them in the envelope, and smiled.

"A very informative letter from—as you no doubt noticed from the seal, My Lord Marquis—Sir Eliot Meredith, my Assistant Chief Investigator. And now, I am prepared to make an arrest for the murder of Master Sir James Zwinge."

"Indeed?" said my lord the Marquis after a moment. "You have solved the case? Without checking the evidence personally? Without questioning a witness? How extraordinarily astute—even for you, my dear cousin."

"You are hardly one to cavil at lack of personal investigation," Lord Darcy said mildly, seating himself comfortably in the red leather chair. "As for my witness, there is no need to question him any further. The information is before us; we have but to examine it."

The Marquis put his palms flat on his desktop, inhaled four pecks of air, and let it out slowly through his nose. "All right. Let's hear it."

"It is simplicity itself. So obvious, in fact, that one tends to overlook it because of the very obviousness of the killer. Consider: A man is killed inside a locked and sealed room—in a hotel full of magicians. Naturally, we are led to believe that it is black magic. Obvious. In fact, *too* obvious. That is exactly what we are supposed to believe."

"How *was* it done, then?" asked the Marquis, becoming interested.

"Zwinge was stabbed to death right in front of the very witnesses who were there to testify that the room was locked and sealed," Lord Darcy said calmly.

My lord the Marquis closed his eyes. "I see. That's the way the wind blows, eh?" He opened his eyes again and looked at Lord Bontrionphe. Lord Bontrionphe looked back at him, steadily, expressionlessly. "Continue, Lord Darcy," the Marquis said. "I should like to hear all of it."

"As you have deduced, dear cousin," Lord Darcy continued, "only Bontrionphe could have done it. It was he who broke the door down. He was the first one in the room. He ordered the others to stay out, to stay back. Then he bent over the unconscious body of Sir James, and, concealing his actions with his own body, sank a knife into the Master Sorcerer's heart."

"How did he know Sir James would be unconscious? Why did Sir James scream? What motive did Bontrionphe have?" The three questions were deliberate, almost emotionless. "You have explanations, I presume?"

"Naturally. There are several drugs in the *materia medica* of the adept herbalist which will cause unconsciousness and coma. Bontrionphe, knowing that Sir James intended to lock himself into his room yesterday morning, managed to slip some such drug into the sorcerer's

morning caffè—a simple job for an expert. After that, all he had to do was wait. Eventually, Sir James would be missed. Someone would wonder why he had not kept an appointment. Someone would check his room and find it locked. At last, someone would ask the management to see if something could be wrong. When the manager found he could not open the door, he would ask for official help. And, fortuitously, Lord Bontrionphe, Chief Investigator for My Lord Marquis of London, just happens to be right on the spot. He calls for an ax and . . ." Lord Darcy turned one hand palm up as though he were handing the Marquis the whole case on a platter, and left the sentence unfinished.

"Go on." There was a dangerous note in the Marquis' voice.

"The scream is easily explained," Lord Darcy said. "Sir James was not completely comatose. He heard Master Sean knock. Now, Sean had an appointment at that time; Sir James knew it was he at the door. Aroused by the knock, he called out: 'Sean! Help!' And then he collapsed back into his drugged coma. Bontrionphe, of course, could not have known that would happen, but it was certainly a stroke of luck, even though it was completely unnecessary to his plan. If there had been no scream, Sean would certainly have known something was amiss and notified the manager. After that, everything would have followed naturally."

Lord Darcy folded his arms, slumped back in the chair, rested his chin on his chest, and looked at the speechless, glowering De London from beneath his brows. "The motive is quite clear. Jealousy."

"*Pah!*" the Marquis exploded. "Now I have you! Up to now, you have been clever. But now you show that your wits are addled. A woman? *Pfui!* Lord Bontrionphe may occasionally play the fool, but he is not a fool about women. I will not go so far as to say that the woman does not live whom Lord Bontrionphe could not get if he wanted her, but I will say that his ego is such that he would have no desire for a woman who did not want him or who had rejected him for another. He would not go out of his way to snap his fingers at such a woman, much less kill because of her."

"Agreed," said Lord Darcy complacently. "I mentioned no woman. And I was not speaking of *his* jealousy."

"Of whose, then?"

"Of yours."

"Hah! This is fatuous."

"Not at all. Your hobby of herb cultivation, my lord, is one of the strongest passions of your life. You are an acknowledged expert and are proud of that fact. Zwinge, too, was a herbalist, but not quite in your league. Still, if you ever had any real rival in the field, it was Master Sir James Zwinge. Recently, Sir James succeeded in growing Polish devilwort from the seed instead of from

cuttings, as is normally done. You have failed to do so. Therefore, out of pique, you asked Bontrionphe to remove your rival; he, out of loyalty, proceeded to do so. And there you have it, my lord: Method, Motive, and Opportunity. *Quod erat demonstrandum.*"

My Lord Marquis swiveled his head and glared at Lord Bontrionphe. "Are you an accessory to this imbecilic tomfoolery?"

Lord Bontrionphe shook his head once, left to right. "No, my lord. But it does look as though he has us dead to rights, doesn't it?"

"Buffoon!" the Marquis snorted. He looked back at Lord Darcy. "Very well. I know when I am being gulled as well as you do. I regret having jailed Master Sean; it was frivolous. And you are well aware that I would just as soon go to the Tower myself as to lose the services of Lord Bontrionphe for any extended length of time. Outside this building, he is my eyes and ears. I will sign an order for Master Sean's release immediately. Since you have been assigned to this case by the King, you will, of course, be remunerated from the Royal Privy Purse?"

"Beginning today, yes," said Lord Darcy. "But there is the little matter of yesterday—including cross-Channel transportation, train ticket, and cab fare."

"Done," the Marquis growled. He signed a release form, poured melted sealing wax on it, and stamped it

with the seal of the Marquisate of London, all without a word. Then he heaved his massive bulk out of the chair. "Lord Bontrionphe, give my lord cousin what is owed him. Open the wall safe and take it out of petty cash. I am going upstairs to the plan rooms." He did not quite slam the door as he left.

Lord Bontrionphe looked at Lord Darcy. "Look here—you don't really think . . ."

"*Chah!* Don't be ridiculous. I know perfectly well that every word of your narrative was accurate and truthful. And the Marquis is quite aware that I know it." Lord Darcy was not one to err in a matter of judgment like that, and, as it turned out, he did not. Lord Bontrionphe's recital was correct and precise in every detail.

"Let's get to the Tower," said Lord Darcy.

Lord Bontrionphe was at his desk taking a pistol out of a drawer. "Just a second, my lord," he said, "I once resolved never to go out on a murder case unarmed. By the way, don't you think it would be best to set up an auxiliary headquarters in the Royal Steward? That way we can keep in touch with each other and with Chief Hennely's plainclothes investigators."

"An excellent idea," said Lord Darcy, "and speaking of plainclothes investigators, did you get statements from everyone concerned yesterday?"

"As many as possible, my lord. Of

course, we couldn't get everyone, but I think the reports we have now are fairly complete."

"Good. Bring them along, will you? I should like to look them over on our way to the Tower. Are you ready to go?"

"Ready, my lord," said Lord Bontrionphe.

"Very well, then," said Lord Darcy. "Come, let's get Master Sean out of durance vile."

X

As the official carriage, bearing the London arms, moved through the streets toward the Royal Steward Hotel, its pneumatic tires jouncing briskly on their spring suspensions as a soft accompaniment to the clapping of the horses' hooves, Sean O Lochlainn, Master Sorcerer, leaned back in the seat, clutching his symbol-decorated carpetbag to his round paunch.

"Ah, my lords," he said to the two men on the seat opposite, "a relief it is, indeed, to be free again. Twenty-four hours of sitting in the Tower is not my notion of a grand time, and you may be sure of that. Not that I object to being alone in a comfortable room for a while; any sorcerer who doesn't take a week or so off every year for a Contemplation Retreat will find his power deserting him. But when there's work to be done . . ." He paused. "My lord, you didn't get me out of the Tower by *solving* this case, did you?"

Lord Darcy laughed. "No fear, my good Sean. You haven't missed any of the excitement yet."

"His lordship," said Lord Bontrionphe, "got you out by simple but effective blackmail."

"Counter-blackmail, if you please," Lord Darcy corrected. "I merely showed De London that Lord Bontrionphe could be jailed on the same sort of flimsy evidence that the Marquis used to jail you."

"Now wait a moment," said Lord Bontrionphe. "The evidence wasn't all *that* flimsy. There was certainly enough—in both cases—to permit holding a man for questioning."

"Certainly," Lord Darcy agreed. "But the Marquis had no intention of questioning Sean. He was adhering to the letter of the law rather than to its spirit. It is a matter of family rivalry; we have, the Marquis and I, similar although not identical abilities, and therefore a basically friendly but at times emotionally charged antagonism. He would not dare have locked up an ordinary subject of His Majesty on such evidence unless he honestly believed that the suspect had actually committed the crime. Indeed, I will go further: he would never even have considered such an act."

"I'm glad to hear you say that," said Lord Bontrionphe, "since it happens to be true. But once in a while, this rivalry goes a little too far. Normally, I keep out of it, but then—"

"Permit me to correct you," Lord

Darcy said with a smile. "Normally, you do *not* keep out of it. To the contrary, you are normally rigidly loyal to My Lord Marquis; you normally take *his* side, forcing me to outwit both of you—an admittedly difficult job. This time, however, you felt that imprisoning Master Sean in order to get at me was just a little too much. I am well aware that, had it been *I* who went to the Tower, the matter would have been quite different."

Lord Bontrionphe gazed dreamily at the roof of the carriage. "Now *there's* a thought," he said in a speculative tone.

"Don't think on it too hard, my lord," said Master Sean with gentle menace. "Not too hard at all, at all."

Lord Bontrionphe brought his eyes down sharply and started to say something, but his words were forever lost as the carriage slowed suddenly and the driver opened the trapdoor in the roof and said:

"The Royal Steward, my lords."

Half a minute later, the footman opened the door, and the three men got out. Lord Bontrionphe quietly slipped a couple of large coins into the footman's hand. "Wait for us, Barney. See that the carriage and horses are taken care of, and then you and Denys wait in the pub across the street. We may be quite some time, so have a few beers and relax. I'll send word if we need you."

"Very good, my lord," Goodman Barney said warmly. "Thank you."

Then Lord Bontrionphe followed

Lord Darcy and Master Sean into the Royal Steward.

Lord Darcy was standing alone just inside the foyer, looking through the glass-paned doors at the crowd in the lobby.

"Where's Master Sean?" Bontriomphe asked.

"In there. I sent him on ahead. As you will observe, there are at least a dozen well-wishers and possibly two dozen who are merely curious, all of whom are crowded around Sean, congratulating him upon his release, saying they knew all along he was innocent, and pumping him for information about the murder of Sir James Zwinge. While their attention is thus distracted, my lord, you and I will make a quiet entrance and go directly to the murder room. Come."

They did not attract attention as they went in. This was Visitors' Day at the Sorcerers Convention, and the lobby was filled with folk who had come to see the displays and the sorcerers themselves. They were just two more sightseers.

At one of the display booths, a journeyman sorcerer was demonstrating a children's toy to two wide-eyed children and a fondly patronizing father. It consisted of a six-inch black wand with one white tip, five differently-colored pith balls an inch in diameter, and a foot-long board with six holes in it, five of which were ringed with colors to match the balls and the fifth one ringed with white.

"Now you'll notice, my lads," said the journeyman sorcerer, "that the balls aren't in their proper holes; the colors don't match. The object of the game is to put 'em right, you see. The rule is that you move one ball at a time, like this:" He aimed the wand at the board, which was several feet away, and one of the balls floated smoothly up and across, to drop into the extra hole. Then another moved into the vacated hole to match colors. The process was repeated until all the balls were in the proper holes. "You see? Now, I'll just mix these balls up again and let you try it, lad. Just point the white tip of the wand and think of which color ball you want to come up; then, when it's in the air, think of the color hole you want it to go to. There, now. That's it—"

It was more than just a toy, Lord Darcy knew; it was a testing and teaching device. With the spell it now had on it, anyone could do the trick; but the spell was timed to fade slowly over a period of a few months. By that time, most children were thoroughly tired of it, anyway. But if a rare child with the Talent got hold of one, his interest usually did not wane. Furthermore, he began to get the feel of the spell itself, aided by the simple ritual and ceremony of the game. If that happened, the child would still be able to do the trick a year later, though none of his un-Talented friends would. The original spell had worn off and had been replaced by the

child's own simple version. A booklet went with the game which explained all that to the parents, urging them to have the child given further tests if he succeeded in preserving the activity of the toy.

At another booth, a priest in clerical black with white lace at collar and cuffs was distributing booklets describing the new building being erected at Oxford to house the Royal Thaumaturgical Laboratories at Edward's College. The display was a scale model of the proposed structure.

Directly in their path, the two men saw what looked like an ordinary door frame. An illusion sign floated in its center, translucent blue letters that said: PLEASE STEP THROUGH.

As they did, the illusion sign vanished and they could feel what seemed to be a slight wind tugging at their clothing. On the other side, another illusion sign appeared.

THANK YOU

If you will examine your clothing, you will see that every speck of loose dust and lint has been removed. This is a prototype device, still in the experimental stage. Eventually, no home will be without one.

Wells & Sons

Thaumaturgical Home Appliances

"Quite a gadget," said Lord Bontriomphe. "Look; even our boots are shiny," he added as they walked through the second sign and it dissolved around them.

"Useful," Lord Darcy agreed, "but quite impracticable. Sean told me they had it at the last Convention. It makes a good advertisement for the company, but that 'no home will be without one' is visionary. Far too expensive, since the spell has to be renewed by a Master Sorcerer at least once a week. With this mob in here, they'll be lucky if they get through the day with it."

"Hm-m-m. Like that 'See London From the Air' device they had a few years back," said Bontriomphe. "Remember that?"

"I read something about it. I don't recall the details," Lord Darcy said.

"It looked quite impressive. They had a crystal ball about"—he held his hands in front of him as though he were grasping an imaginary sphere—"oh, ten inches in diameter, I guess. It was mounted on a pedestal, and you looked into it from above. It gave you the weird feeling that you were looking down from a great height, from a point just above Admiral Buckingham Hall, where the exhibit was. You could actually see people walking about, and carriages moving through the streets, as though you were up in a cathedral spire looking down. There was a magic mirror suspended a couple of hundred feet above the building, you see, which projected the scene into the crystal by psychic reflection."

"Ah, I see. Whatever happened to it? I've heard no more about it," Lord Darcy said.

"Well, right off the bat, the War Office was interested. You can imagine what sort of reconnaissance you'd have, with a magic mirror floating high over enemy lines and an observer safe behind your own lines watching everything they were doing. Anyway, the War Office thaumaturgists are still working on it, but it hasn't come to anything. In the first place, it takes three Masters to run it: One to levitate the mirror, one to keep the mirror activated, and one to keep the receiving crystal activated. And they have to be specially trained for the job and then train together as a team. In the second place, the sorcerers controlling the mirror have to be within sight of the mirror, and the plane of the surface has to be perpendicular to a radius of the crystal ball. Don't ask me why; I'm no sorcerer and I don't know a thing about the theory. At any rate, the thing hasn't been made practical for long distance transmission of images yet."

They left the lobby and started upstairs toward the late Sir James Zwinge's room.

"So far," said Lord Darcy, "aside from such things as the semaphore and the heliotelegraph—both of which require line-of-sight towers for transmission—the only practical means of long distance communication we have is the teleson. And the mathematical thaumaturgists still have not come up with a satisfactory theory to explain its functioning.

Ah! I see that your Armsmen are on duty." They had reached the top of the stairway. Down the hall, directly in front of the door to the murder room were two black-clad Armsmen of the King's Peace.

"Good morning, Jeffers, Dubois," said Lord Bontrionphe as he and Lord Darcy approached the door.

The Armsmen saluted. "Good morning, my lord," said the older of the two.

"Everything all right? No disturbances?"

"None, my lord. Quiet as a tomb."

"Jeffers," said Lord Bontrionphe with a smile, "with a sense of humor like that, you will either rise rapidly to Master-at-Arms or you will remain a foot patrolman all your life."

"My ambition is modest, my lord," said Jeffers with a straight face. "I only wish to become a Sergeant-at-Arms. For that, I need only to be a half-wit."

"Foot patrolman," Lord Darcy said sadly. "Forever." He looked at the door to the murder room. "I see they have covered the hole in the door."

"Yes, my lord," said Jeffers. "They just tacked this panel over the hole. Otherwise, the door's untouched. Would you be wanting to look in, my lords?" He took a large, thick, heavy brass key from the pouch at his belt. "This is Sir James' key," he said. "You can open the door, but Grand Master Sir Lyon has put a spell on the room itself, my lords."

Lord Darcy took the key, fitted it into the long, narrow keyhole, turned the bolt, and opened the door. He and Lord Bontrionphe stopped at the threshold.

There was no tangible barrier at the door. There was nothing they could see or touch. But the barrier was almost palpably there nonetheless. Lord Darcy found that he had no desire to enter the room at all. Quite the contrary; he felt a distinct aversion to the room, a sense of wanting to avoid, at all costs, going into that room for any reason whatever. There was nothing in that room that interested him, no reason at all why he should enter it. It was taboo—a forbidden place. To look from without was both necessary and desirable; to enter was neither necessary nor desirable.

Lord Darcy surveyed the room with his eyes.

Master Sir James Zwinge still lay where he had fallen, looking as though he had died only minutes before, thanks to the preservative spell which had been cast over the corpse.

Footsteps came down the hall. Lord Darcy turned to see Master Sean approaching.

"Sorry to be so long, my lord," said the sorcerer as he neared the door. He stopped at the threshold. "Now what have we here? Hm-m-m. An aversion spell, eh? Hm-m-m. And cast by a Master, too, I'll be bound. It would take quite a time to solve that one." He stood looking through the door.

"It was cast by Grand Master Sir Lyon himself," said Lord Darcy.

"Then I'll go fetch him to take it off," said Master Sean. "I wouldn't waste time trying to take it off myself."

"Pardon me, Master Sorcerer," said Armsman Jeffers deferentially, "are you Master Sean O Lochlainn?"

"That I am."

The Armsman took an envelope from an inside jacket pocket. "The Grand Master," he said, "told me to be sure and give this to you when you came, Master Sean."

Master Sean placed his symbol-decorated carpetbag on the floor, took the envelope, opened it, extracted a single sheet of paper, and read it carefully.

"Ah!" he said, his round Irish face beaming. "I see! Ingenious! I shall most certainly have to remember that one!" He looked at Lord Darcy with the smile still wreathing his face. "Sir Lyon has given me the key. He expected me to be here this morning. Now, if you'll excuse me for a few minutes—"

The tubby little Irish sorcerer knelt down and opened his carpetbag. He fished around inside and took out a gold-and-ebony wand, a small brazen bowl, an iron tripod with six-inch legs, two silver phials, and an oddly constructed flint-and-steel fire-striker.

The others stepped back respectfully. One does not disturb a magician at work.

Master Sean placed the tripod on the floor just in front of the open door and set the small brazen bowl on top of it. Then he put in a few lumps of charcoal from his carpet-bag. Within two minutes, he had the coals glowing redly. Then he added a large pinch of powder from each of the two silver phials, and a dense column of aromatic blue-gray smoke arose from the small brazier. Master Sean traced a series of symbols in the air with his wand while he murmured something the others could not hear. Then he carefully folded, in an intricate and complex manner, the letter from Sir Lyon Grey. When it was properly folded, he dropped it on the coals. As it burst into flame, he traced more symbols and murmured further words.

"There," he said. "You can go in now, my lords."

The two investigators walked across the threshold. Their aversion to doing so had completely vanished. Master Sean took a small bronze lid from his carpetbag and fitted it tightly over the mouth of the little brazier.

"Just leave it there, lads," he said to the two Armsmen. "It will cool off in a few minutes. Mind you don't knock it over, now." Then he joined Lord Darcy and Lord Bontrionphe inside the murder room.

Lord Darcy closed the door and looked at it. From the inside, the damage done by Lord Bontrionphe's ax work was plainly visible.

Otherwise, there was nothing unusual about the door. A rapid but thorough inspection of the doors and windows convinced Lord Darcy that Lord Bontrionphe had been absolutely right when he said the room was sealed. There were no secret panels, no trapdoors. The windows were firmly bolted, and there was no way they could have been bolted from the outside by other magical means.

With difficulty, Lord Darcy slid back the bolt on one of the windows and opened it. It creaked gently as it swung outward.

Lord Darcy looked out the window. There was a thirty-foot drop of smooth stone beneath him. The window opened onto a small courtyard, where several chair-surrounded tables formed a part of the dining facilities of the Royal Steward Hotel.

Some of the tables were occupied. Five sorcerers, three priests, and a bishop had all heard the window open and were looking up at him.

Lord Darcy craned his neck around and looked up. Ten feet above were the windows of the next floor. Lord Darcy pulled his head back in and closed the window.

"No one went out that way," he said firmly. "For an ordinary man to have done so would have required a rope. He would have had either to slide down thirty feet or to climb up ten feet hand over hand."

"An *ordinary* man," said Lord Bontrionphe, emphasizing the word. "But levitation is not too diffi-

cult a trick for a Master Sorcerer.”

“What say you, Master Sean?” Lord Darcy asked the tubby little sorcerer.

“It could have been done that way,” Master Sean admitted.

“Furthermore,” said Lord Bontrionphe, “those bolts could have been thrown from the outside by magic.”

“Indeed they could,” Master Sean agreed.

Lord Bontrionphe looked expectantly at Lord Darcy.

“Very well,” said Lord Darcy with a smile, “let us proceed to try that theory by what the geometers call, I believe, the *reductio ad absurdum*. Imagine the scene. What happens?”

He gestured toward the body on the floor. “Sir James is stabbed. Our sorcerer-murderer—if you’ll pardon the double entendre—goes to the window. He opens it. Then he steps up to the sill and steps out into empty air, levitating himself as he does so. Then he closes the window and proceeds to cast a spell which slides the bolts into their sockets. When that is done, he floats off somewhere—up or down, it matters not which.” He looked at Master Sean. “How long would that take?”

“Five or six minutes at the least. If he could do it at all. Levitation causes a tremendous psychic drain; the spell can only be held for a matter of minutes. In addition, you’re asking him to cast a second spell while he’s holding the first. A spell

of the type that was cast on this room is what we call a *static* spell, my lord. It imposes a *condition*, you see. But levitating and the moving of bolts are *kinetic* spells; you have to keep them moving. To use two kinetic spells at the same time requires tremendous concentration, power, and precision. I would hesitate, myself, to try casting a window-locking spell with a thirty-foot drop beneath me. Certainly not if I were in a hurry or distracted.”

“And even if it could be done, it would take five or six minutes,” Lord Darcy said. “Bontrionphe, would you mind opening the *other* window? We haven’t tested it yet.”

The London investigator drew back the bolt and pushed the window open. It groaned audibly.

“What do you see out there?” Lord Darcy asked.

“About nine pairs of eyes staring up at me,” Lord Bontrionphe said.

“Exactly. Both windows make a slight noise when they are opened. That noise is quite audible in the courtyard below. Yesterday morning, Sir James’ scream was clearly audible through that window, but even if it had not been—even if Sir James had not screamed at all when he was stabbed—the killer could not have gone out through that window without being seen, much less hovered there for five or six minutes.”

Lord Bontrionphe pulled the window closed again. “What if he were invisible?” he asked, looking at the little Irish sorcerer.

"The Tarnhelm Effect?" asked Master Sean. He chuckled. "My lord, regardless of what the layman may think, the Tarnhelm Effect is extremely difficult to use in practice. Besides, 'invisibility' is a layman's term. Spells using the Tarnhelm Effect are very similar in structure to the aversion spell you met at the door to this room. If a sorcerer were to cast such a spell about himself, your eyes would avoid looking directly at him. You wouldn't realize it yourself, but you would simply keep your eyes averted from him at all times. He could stand in the middle of a crowd and no one could later swear that he was there because no one would have seen him except out of the corner of the eye, if you follow me.

"Even if he were alone, you wouldn't see him because you'd never look at him. You would subconsciously assume that whatever it was you were seeing out of the corner of your eye was a cabinet or a hatrack or an umbrella stand or a lamppost—whatever was most likely under the circumstances. Your mind would explain him away as something that *ought* to be there, as a part of the normal background and therefore unnoticeable.

"But he wouldn't actually be invisible. You could see him, for instance, in a mirror or other reflecting surface simply because the spell wouldn't keep your eyes away from the mirror."

"He could cast a sight-avoidance

spell on the mirror, couldn't he?" Lord Bontrionphe asked. "That's a static spell, I believe."

"Certainly," said Master Sean. "He could cast a sight-avoidance spell on every reflecting surface in the place. But a man has to look *somewhere*, and even a layman would get suspicious under circumstances like that. Besides, to anyone with even a half-trained Talent, he'd be detectable immediately.

"And even supposing he did make himself invisible outside that window, do you realize what he would have to do? Now you have him juggling three spells at once: he's levitating himself; he's making himself 'invisible'; and he's closing that window.

"No, my lord; it won't do. It just isn't humanly possible."

Lord Darcy let his gaze wander over the room. "That's settled, then. Our killer did not go out those windows either by thaumaturgical or by ordinary physical means. Therefore, we—"

"Wait a minute!" said Lord Bontrionphe, his eyes widening. He pointed a finger at Master Sean. "Look here; suppose it happened this way. The killer stabs Master Sir James. His victim screams. The killer knows that you are outside the door. He knows he can't get out through the door. The windows are out, too, for the reasons you've just given. What can he do? He uses the Tarnhelm Effect. When I come busting in here with an ax, I don't

see him. As far as I'm concerned, the room is empty except for the corpse. I wouldn't be able to see him, would I? Then, when the door's open, he walks out as cool as an oyster, with nobody noticing him."

Master Sean shook his head. "You wouldn't notice him; that's so. But I would have. And so would Grand Master Sir Lyon. We were both looking in through that hole in the door, and a man can see the whole room from there—even the bathroom, when the door to it is open."

Lord Bontrionphe looked at the bathroom through the open door. "No, you can't. Take a look. Suppose he were lying down in the tub. You couldn't even see him from in here."

"True. But I distinctly recall your looking down directly into the tub. You couldn't have done that if a killer using the Tarnhelm Effect were in it."

Lord Bontrionphe frowned thoughtfully. "Yes. I did. Hm-m-m. Well, that eliminates that. He wasn't in the room, and he didn't leave the room." He looked at Lord Darcy. "What does that leave?"

"We don't know yet, my dear fellow. We need more data." He stepped over to where the body lay and knelt down, being careful not to disturb anything.

Master Sir James Zwing had been a short, lean man, with receding gray hair and a small gray beard and moustache. He was wearing a

neat, fairly expensive gentleman's suit, rather than the formal sorcerer's costume to which he was entitled. As Bontrionphe had said, it was difficult to see the stab wound at first glance. It was small, barely an inch long, and had not opened widely. It was further obscured by the blood which covered the front of the dead magician's clothing. Nearby, a black-handled, silver-bladed knife lay in the pool of blood on the floor, its gleaming blade splashed with red.

"This blood—" Lord Darcy gestured with his hand. "Are you absolutely certain, Bontrionphe, that it was fresh when you broke into this room?"

"Absolutely certain," Bontrionphe said. "It was bright red and still liquid. There was still a slight flow of blood from the wound itself. I'll admit I am not a surgeon, but I am certainly no amateur when it comes to knowing something about *that* particular subject. He couldn't have been dead more than a few minutes when I first saw his body."

Lord Darcy nodded. "Indeed. The condition of the blood even now, under the preservative spell, shows a certain freshness."

He gestured toward a key that lay a few feet away from the body. "Is that your key, my lord?"

Lord Bontrionphe nodded. "Yes. I put it there to mark the spot when I picked up Sir James' key."

"It is still where you put it?"

"Yes."

Lord Darcy measured the distance

between the key and the door with his eye. "Four and a half feet," he murmured. He stood up. "Give me Sir James' key. Thank you. An experiment is in order."

"An experiment, my lord?" Master Sean repeated. His face brightened.

"Not of the thaumaturgical variety, my good Sean. That will come in good time." He walked over to the door and opened it, ignoring the two Armsmen who stood at attention outside. He looked down at his feet. "Master Sean, would you be so good as to remove this brazier?"

The tubby little Irish sorcerer bent over and put his hand near the brazen bowl. "It's still a little hot. I'll put it on the table." He picked up the tripod by one leg and carried it into the room.

"I don't see what you're getting at," said Lord Bontrionphe.

"Surely you have noticed the clearance between the bottom of the door and the floor?" Lord Darcy said. "Is it possible that the murderer simply stabbed Sir James, came out, locked the door behind him, and slid the key back under the door?"

Master Sean blinked. "With me standing outside the door all the time?" he said in surprise. "Why, that's impossible!"

"Once we have eliminated the impossible," Lord Darcy said calmly, "we shall be able to concentrate on the merely improbable."

He knelt down and looked at the floor beneath the door. "As you see,

the space is somewhat wider than it appears to be from the inside. The carpeting does not extend under the door. Close the door, if you will, Master Sean."

The sorcerer pushed the door shut and waited patiently on the other side. Lord Darcy put the heavy brass key on the floor and attempted to push it under the door. "I thought not," he said, almost to himself. "The key is much too large and thick. It can be forced under—" He pushed hard at the key. "But it wedges tight. And the thickness of the carpet would stop it on the other side." He pulled the key out. "Open the door again, Master Sean."

The door swung inward. "Observe," Lord Darcy continued, "how the attempt to push it under has scored the wood at that point. It would be impossible even to make the attempt without leaving traces, much less—" He paused, cutting off his own words abruptly. "What is this?" he said, leaning over to peer more closely at a spot on the carpet inside the room.

"What's *what*?" asked Lord Bontrionphe.

Lord Darcy ignored him. He was looking at a spot on the carpet near the right-hand doorpost, on the side away from the hinges, and approximately eight inches in from the edge of the carpet itself.

"May I borrow your magnifying glass, Master Sean?" Lord Darcy said without looking up.

"Certainly." Master Sean went over to the table, opened his symbol-decorated carpetbag, took out a large bone-handled lens, and handed it to his lordship.

"What is it?" he asked, echoing Lord Bontrionphe's question. He knelt down to look, as Lord Darcy continued to study a small spot on the carpet without answering.

The mark, Master Sean saw, was a dark stain in the shape of a half circle, with the straight side running parallel to the door and the arc curving in toward the interior of the room. It was small, about half the size of a man's thumbnail.

"Is it blood?" asked Master Sean.

"It is difficult to tell on this dark green carpet," said Lord Darcy. "It might be blood; it might be some other dark substance. Whatever it is, it has soaked into the fibers of the pile, although not down to the backing. Interesting." He stood up.

"May I?" said Lord Bontrionphe, holding out his hand for the glass.

"Certainly." He handed over the lens, and while the London investigator knelt to look at the stain, Lord Darcy said to Master Sean: "I would be much obliged, my dear Sean, if you would make a similarity test on that stain. I should like to know if it is blood, and, if so, whether it is Sir James' blood." He narrowed his eyes thoughtfully. "And while you're at it, do a thorough check of the blood-stain around the body. I should like to be certain that all of the blood is actually Sir James Zwinge's."

"Very good, my lord. Would you want any other tests besides the usual ones?"

"Yes. First: Was there, *in fact*, anyone at all in this room when Sir James Zwinge died? Second: If there was any black magical effect directed at this room, of what sort was it?"

"I shall endeavor to give satisfaction, my Lord," Master Sean said doubtfully, "but it won't be easy."

Lord Bontrionphe rose to his feet and handed Master Sean the magnifying glass. "What would be difficult about it?" he asked. "I know those tests aren't exactly routine, but I've seen journeyman sorcerers perform them."

"My dear Bontrionphe," said Lord Darcy, "consider the circumstances. If, as we assume, this act of murder was committed by a magician, then he was most certainly a master magician. Knowing, as he must have, that this hotel abounds in master magicians, he would have taken every precaution to cover his tracks and hide his identity—precautions that no ordinary criminal would ever think of and could not take even if he *had* thought of them. Since Master Sir James was killed rather early yesterday morning, it is likely that the murderer had all of the preceding night for the casting of his spells. Can we, then, expect Master Sean to unravel in a few moments what another master may have taken all night to accomplish?"

He put his hand into an inside jacket pocket and took out the envelope which De London had handed him earlier. "Besides, I have further evidence that the killer or killers are quite capable of covering their tracks. This morning's communication from Sir Eliot Meredith, my Chief Assistant, is a report of what he has thus far discovered in regard to the murder of the double agent Georges Barbour in Cherbourg. It contains two apparently conflicting pieces of information." He looked at Master Sean.

"My good Sean. Would you give me your professional opinion of the journeyman who is the forensic sorcerer for Chief Master-at-Arms Henri Vert in Cherbourg?"

"Goodman Juseppy?" Master Sean pursed his lips, then said: "Competent, I should say; quite competent. He's not a Master, of course, but—"

"Would you consider him capable of bungling the two tests which I have just asked you to perform?"

"We are all capable of error, my lord. But . . . no. In an ordinary case, I should say that Goodman Juseppy's testimony as to his results would be quite reliable."

"In an ordinary case. Just so. But what if he were pitted against the machinations of a Master Sorcerer?"

Master Sean shrugged. "Then it's certainly possible that his results might be in error. Goodman Juseppy simply isn't of that caliber."

"Then that may account for the conflicting evidence," Lord Darcy said. "I hesitate to say definitely that it does, but it may."

"All right," said Lord Bontrionphe impatiently, "just what is this conflicting evidence?"

"According to Goodman Juseppy's official report, there was no one in Barbour's room at the time he was killed. Furthermore, there had not been anyone but himself in the room for several hours before."

"Very well," said Lord Bontrionphe, "but where is the conflict?"

"The second test," said Lord Darcy calmly. "Goodman Juseppy could detect no trace whatever of black magic—or, indeed, of any kind of sorcery at all."

In the silence that followed, Lord Darcy returned the envelope to his jacket pocket.

Master Sean O Lochlainn sighed. "Well, my lords, I'll perform the tests. However, I should like to call in another sorcerer to help. That way—"

"No!" Lord Darcy interrupted firmly. "Under no circumstances! As of this moment, Master Sean, you are the only sorcerer in this world in whom I can unhesitatingly place complete trust."

The little Irish sorcerer turned, took a deep breath, and looked up into Lord Darcy's eyes. "My lord," he said in a low, solemn voice, "in all humility I wish to point out that while yours is undoubtedly the fin-

est deductive mind upon the face of this Earth, *I am a Master Sorcerer.*” He paused. “We have worked together for a long time, my lord. During that time I have used sorcery to discover the facts, and you have taken those facts and made a cogent case of them. You cannot do the one, my lord, and I cannot do the other. Thus far there has been a tacit agreement between us, my lord, that I do not attempt to do your job, and you do not attempt to do mine. Has that agreement been abrogated?”

Lord Darcy was silent for a moment, trying to put his thoughts into words. Then, in a startlingly similar low voice, he said: “Master Sean, I should like to express my most humble apologies. I am an expert in my field. You are an expert on sorcery and sorcerers. Let it be so. The agreement has *not* been abrogated—nor, I trust, shall it ever be.”

He paused for a moment, then, after a deep breath, said, in a more normal tone of voice, “Of course, Master Sean. You may choose any kind of consultation you wish.”

During the moment of tension between the two friends, Lord Bontrionphe had quietly turned away, walked over to the corpse, and looked down at it without actually seeing it.

“Well, my lord—” There was just the slightest touch of embarrassment in Master Sean’s voice. He cleared his throat and began again. “Well,

my lord, it wasn’t exactly consultation I was thinking of. What I really need is a good assistant. With your permission, I should like to ask Lord John Quetzal to help me. He’s only a journeyman, but he wants to become a forensic sorcerer and the experience will be good for him.”

“Of course, Master Sean, an excellent choice I should say. Now let me see—” He looked across at the body again. “I shan’t disturb the evidence any more than is necessary. Those ceremonial knives are all constructed to the same pattern, are they not?”

“Yes, my lord. Every sorcerer must make his own, with his own hands, but they are built to rigid specifications. That’s one of the things an apprentice has to learn right off, to build his own tools. You can’t use another man’s tools in this business, nor tools made by an ordinary craftsman. It’s the making of them that attunes them to the individual who uses them. They must be generally similar and individually different.”

“So I understand. Would you permit me to examine your own, so that I need not disturb Sir James?”

“Of course.” He got the knife from his carpetbag and handed it to his lordship. “Mind you don’t cut yourself; that blade is razor sharp.”

Lord Darcy eased the onyx-handled knife from its black cuirbouilli sheath. The gleaming blade was a perfect isosceles triangle, five inches from handguard to point

and two inches wide at the hand-guard. Lord Darcy turned it and looked at the base of the pommel. "This is your monogram and symbol. I presume Sir James' knife is identified in the same way?"

"Yes, my lord."

"Would you mind looking at that knife and telling me whether you can positively identify it as his?"

"Oh, that's the first thing I looked at. Many's the time I've seen it, and it's his knife, all right."

"Excellent. That accounts for its being here." He slid the deadly-looking blade back into its sheath and handed it back to the little sorcerer.

"That blade is pure silver, Master Sean?" Lord Bontrionphe asked.

"Pure silver, my lord."

"Tell me: how do you keep a razor edge on anything that soft?"

Master Sean smiled broadly. "Well, I'll admit it's a hard job getting the edge on it in the first place. It has to be finished with jeweler's rouge and very soft kidskin. But it's only used as a symbolical knife, d'ye see. We never actually cut anything material with it, so it never needs to be sharpened again if a man's careful."

"But if you never cut anything with it," said Lord Bontrionphe, "then why sharpen it at all? Wouldn't it work as well if its edges were as dull as, say, a letter opener?"

Master Sean gave the London investigator a rather pained look.

"My lord," he said with infinite patience, "This is a symbol of a *sharp* knife. I also have a slightly different one with blunt edges; it is a symbol for a *dull* knife. Your lordship should realize that, for many purposes, the best symbol for a thing is the thing itself."

Lord Bontrionphe grinned and raised one hand, palm outward. "Sorry, Master Sorcerer; my apologies. But please don't give me any lectures on advanced symbolic theory. I never could get it through my head."

"Is there anything else you wanted to look at, Bontrionphe?" Lord Darcy asked briskly. "If not, I suggest we be on our way, and permit Master Sean to go about his work. We will instruct the guards at the door that you are not to be disturbed, Master Sean. When you have finished, notify Chief Master-at-Arms Hennely Grayme that we should like an autopsy performed upon the body immediately. And I should appreciate it very much if you would go to the morgue and personally supervise the surgeon's work."

"Very well. I'll see to it. I'll get the report to My Lord Marquis' office as soon as possible."

"Excellent. Come, Bontrionphe; there is work to be done."

XI

As Lord Bontrionphe gave instructions to the Armsmen outside

the late Master Sir James Zwinge's room, Lord Darcy walked across the hall to the door facing the murder room and rapped briskly on it at a point just above the keyhole.

"Are you decent, Your Grace?"

There was a muffled flurry of movement inside, and the door flew open. "Lord Darcy!" said the Dowager Duchess of Cumberland, flashing him a brilliant smile. "You startled me, my lord."

Lord Darcy pitched his own voice low enough so that the Armsmen and Lord Bontriomphe could not hear. "There is an old adage to the effect that people who listen at keyholes often hear things that startle them."

Raising his voice to a normal speaking tone, he went on. "I should like to speak to Your Grace privately for a moment, if I may."

"Certainly, my lord." She stepped back to let him in the room, and he closed the door behind him.

"What is it?" she asked.

"A few quick questions, Mary. I need your help."

"I thought you were going back to Cherbourg as soon as you got Master Sean out of the Tower."

"Circumstances have changed," he cut in. "Bontriomphe and I are working together on the case. But never mind that now. When you told me about Mistress Tia last night, the one thing you failed to mention was her connection with Sir Thomas Leseaux."

Her Grace's blue eyes widened.

"But—aside from the fact that he was among those who recommended her for apprenticeship in the Guild, I don't know of any connection. Why?"

Lord Darcy frowned in thought. "Unless I am very much mistaken, the connection goes a great deal deeper than that. Sir Thomas is in love with the girl—or thinks he is. He is also afraid that she might be mixed up in something illegal, something criminal—and he is afraid to admit the possibility to himself."

"Criminal? Do you mean Black Magic or . . ." she hesitated, "the actual murder of Sir James?"

"I don't know. It might be either or both—or something completely different. But I am not so much interested in what Sir Thomas suspects as I am in what the girl was and is actually doing that may be connected with the murder. At the same time, I do not want her to know that she is suspected in any way. Therefore, I would rather not question her myself. She has already undergone the routine questioning by a plainclothes Sergeant-at-Arms; to subject her to any further questioning would indicate that we have singled her out for special treatment. So far, she does not know that she was seen leaving Sir James' room, and I am not ready for her to know yet."

"You want me to question her, then?" asked the Duchess, her eyes almost sparkling with animation.

"Precisely. I know you, Mary; you are going to snoop anyway, and I would much prefer that all the snoopers in this case have their activities co-ordinated as much as possible. So your job will be Mistress Tia. Question her—but not directly. Use indirectness and subtlety. Get to know her; gain her confidence if you can. Certainly there would be nothing suspicious about the two of you discussing the murder. I dare say everyone in the hotel is discussing it."

She laughed. "Discussing it? Haven't you felt the psychic tension in this place?"

"To a certain extent, but not, obviously, to the degree that you can sense it."

"Well, it's there, all right. There have been enough protective spells cast, enough amulets charged, enough charms and counter-charms worked in the past twenty-four hours to ward off a full phalanx of the Legions of Hell." Her smile faded. "They're not only talking about it, my dear; they're doing something about it. The Guild is a damn sight more disturbed than it would appear upon the surface. There is a Black Sorcerer around with enough power to kill Master Sir James Zwing. That's enough to make a Master edgy; what do you think it's doing to us journeymen? We've *got* to find him—and yet the counterspells in this hotel have obfuscated any trace of the kind of evil malignancy that should be

hanging like swamp fog over the place. It has all of us in a tizzy."

"I shouldn't wonder," Lord Darcy said. "But at least that will allow you to bring up the subject at any time without arousing suspicion."

"True. But there's another factor we'll have to consider. It will soon be all over the place, if it isn't already, that you are working on this case, and it is certainly no secret that you and I are friends. If Mistress Tia knows that, *she* may try to pump *me* for information."

"Let her try, my dear. Find out what kind of information she's looking for. If she just asks questions that would be normal under the circumstances, that tells us one thing. If the questions seem a little too urgent or a trifle off-key, that tells us another. But don't give her any information except what is common knowledge. Tell her that I am reticent, that I am dull, that I am a bore—anything you like, so long as you make it clear to her that I tell you nothing.

"And try to keep a close watch on the girl, if you can do it without being too conspicuous about it.

"Will you do that for me, Mary?"

"I'll do my best, my lord."

"Excellent. Lord Bontrionphe and I will be setting up a temporary headquarters here in the hotel. There will be a Sergeant-at-Arms on duty there at all times. If you have any messages for me, let him know, or leave a sealed envelope with my name on it."

"Very well," said Her Grace, "I'll take the job. Be on about your snooping, and I shall be on about mine."

Lord Bontrionphe was waiting patiently in the hall outside.

"Where now?" he asked.

"Down to see the General Manager, Goodman Lewie," said Lord Darcy. "We may as well make arrangements for our temporary headquarters." They walked on down the hall. "Do you have three good Sergeants-at-Arms to spare for this duty, so we can have someone there twenty-four hours a day?"

"Easily," Lord Bontrionphe said. "Plainclothes or uniformed?"

"Uniformed, by all means. Everyone will know they are Armsmen anyway, and Armsmen in uniform will draw attention away from any plainclothes operatives we may need to use."

"Right. I'll arrange it with Chief Hennely."

Downstairs at the desk, Lord Bontrionphe asked to speak to Goodman Lewie Bolmer. The clerk disappeared and returned a minute later and said: "Goodman Lewie asks if you would be so good as to come back to his office, my lords."

The two investigators followed the clerk back to an office at the rear of the registration desk. Lewie Bolmer stood up as they were shown in.

The general manager looked haggard. Except for the dark pouch-

es beneath his eyes, his saggy face looked pale and sallow, as though the folds and bags of translucent skin that made up his face were filled with soft suet instead of flesh. His smile seemed genuine, but it was as tired as the rest of him.

"Good afternoon, your lordships," he said. "How may I help you?"

Lord Bontrionphe introduced Lord Darcy, and then explained their need for a temporary headquarters.

"I think . . . yes, we have just the thing," said the manager after a moment's thought. "I can put you in the night manager's office. He can double up with the afternoon manager if . . . uh . . . when he comes back to work. I'll clean out his desk and . . . uh . . . put his stuff in the other office. It's a fairly good-sized office—just a little smaller than this one. Will that do?"

"We'd like to take a look at it, if we may," said Bontrionphe.

"Certainly. If your lordships will come this way—"

He led them to a corridor that ran from the lobby to the rear of the building, just to one side of the registration desk. There were two doors leading off it to the right, just a few yards from the lobby. Further back, more doors led off on either side. Goodman Lewie opened the second of the two doors.

"The first one is the afternoon manager's office," he explained. "This is what I had in mind, your

lordships." He waved his hand in a gesture that took in the fifteen-by-fifteen room.

"It looks fine to me," said Lord Bontrionphe. "What do you think, Darcy?"

"Perfectly satisfactory, I should say." He looked down the corridor toward the rear of the building. "Where does this corridor lead, Goodman Lewie?"

"Those are the service rooms back there, your lordship. Lumber rooms, furniture repair workshop, laundry, janitors' supplies—that sort of thing. The door at the far end is the back entrance. It opens into Potsmoke Alley, which is an extension of Upper Swandham Lane."

"Can it be opened from the outside?"

"Only with a key. It has a night lock on it. Anyone could go out, but one needs a key to get back in."

"I have an idea," said Lord Bontrionphe. "We can station an Armsman back there to make sure no unauthorized person comes in, then we'll unlock the door. That way, the Armsmen can come and go as necessary without tromping through your lobby and disturbing your guests. Would that be all right?"

"Of course, your lordship!"

"Good. I'll have a Sergeant-at-Arms down here to take charge of the office."

"Very well, your lordship. I'll have the desk cleared out. Will there be anything else?"

"Yes," said Lord Darcy. "One other thing. Yesterday, the hotel was closed to all except members of the Healers' and Sorcerers' Convention, was it not?"

"And their guests, yes. Only those who had business here were allowed in. The doormen had explicit orders about that.

"I see. Is any record kept?"

"Oh, yes. There is a register book kept at the door at all times. Not today, of course, since this is Visitor's Day, but during those times when the Convention is closed."

"I should like to see it, if I may," Lord Darcy said.

"You certainly may, your lordship. Shall we return to my office? I'll fetch the register book for you."

A minute or so later, the three men were looking at a clothbound register book which lay open on Bolmer's desk.

"That's the page for Wednesday," Lewie Bolmer said. "From midnight to midnight."

Lord Darcy and Lord Bontrionphe looked down the list. There were four columns, marked *Time Arrived*, *Name*, *Business*, and *Time Departed*.

There were not many entries; the first one was for half past six, when a man from the Royal Postal Service had delivered the mail; he had left again at 6:35. At twelve minutes of nine Commander Lord Ashley had arrived, giving as his business "Official message for Master

Sorcerer Sean O Lochlainn." He had left at 9:55. At two minutes after nine, Lord Bontrionphe had come in, on "Personal business of the Marquis de London." No time of departure was noted. The next entry was for 9:51. It simply said "Chief Master-at-Arms Hennely Grayme and four Men-at-Arms. On the King's Business."

"No help there," said Lord Bontrionphe. "But then, I didn't expect there would be."

Lord Darcy grinned. "What kind of entry were you expecting? '9:20 a.m.; Master Sorcerer Lucifer S. Beelzebub. Business: To murder Master Sir James Zwing. Exit time: 9:31' I suppose?"

"That would have been helpful," admitted Lord Bontrionphe.

"I notice there's no exit time down for you or for the Armsmen." He looked up at Goodman Lewie. "Why is that?"

The hotel manager was stifling a yawn. "Eh? What, your lordship? The time of leaving? Well, there were so many Armsmen in and out that I simply gave the doormen orders to allow any Officer of the King's Peace to come and go as he pleased." He stifled another yawn. "Pardon me. Lack of sleep. My night manager, who has the mid-night to-nine shift, didn't show up for work last night, so I had to take over."

"Perfectly all right," said Lord Darcy, still looking at the register book. There were more entries in

the afternoon, mostly merchants and manufacturers who used sorcery or employed sorcerers in the course of their business. One entry caught his eye.

"What's this?" he said, tapping it with his finger.

Lord Bontrionphe read it aloud: "'2:54; Commander Lord Ashley; official business with Manager Bolmer.' No exit time marked."

"Wuh . . . well, your lordships, there were several Navy men in and out. Official business, you know."

"Official business? Why did they want to talk to you?" Darcy asked.

"Not to me. To . . . to Paul Nichols, my night manager."

"About what?"

"I . . . I'm not at liberty to say, your lordship. Strict instructions from the Admiralty. In the King's Name."

"I see," said Lord Darcy in a hard voice. "Thank you, Goodman Lewie. There will be a Sergeant-at-Arms around later to take over that office. Come on, Bontrionphe." He turned and strode out of the office, with Lord Bontrionphe at his heels.

They were halfway across the lobby, threading their way through the crowded exhibits, before Lord Bontrionphe spoke. "Do I detect blood in your eye?"

"Damn right you do," snapped Darcy. "How far is the Admiralty Office from here?"

"Ten minutes if we walk, or we can take the coach and get there in three."

"The coach, by all means," said Lord Darcy.

Barney, the footman, was standing near the coach, which was drawn up alongside the curb a few yards from the front door of the Royal Steward.

"Barney," Lord Bontriomphe shouted. "Where's Denys?"

"Still in the pub, my lord," the footman called back.

"Get ready to go, I'll fetch him." He ran across the street to the pub and was out again thirty seconds later with the coachman running alongside him.

"To the Admiralty Office!" Lord Bontriomphe ordered as Denys climbed into his seat. "As fast as you can." He climbed inside with Lord Darcy.

"So Smollett is holding out on us," he said, as the coach started forward with a jerk.

"He knows something we don't, that's for certain," said Lord Darcy.

"Keep in mind that those orders to keep quiet were given to Bolmer yesterday, before the King ordered us to work together."

"True," said Lord Darcy, "but considering the fact that the Navy is all in a pother about a man who has suddenly turned up missing, and that Goodman Lewie Bolmer shows by his behavior that he is convinced that his night manager will not return, doesn't it seem odd to you that neither Smollett nor Ashley mentioned it to us this morning?"

"More than odd," Lord Bontriomphe agreed. "That's what I said: Smollett is holding out on us. You want to hold him while I poke him in the eye, or the other way around?"

"Neither," said Lord Darcy. "We'll each take an arm and twist."

To be continued

IN TIMES TO COME

Next month's cover story—cover by Schoenherr—is Christopher Anvil's novelette "Strangers To Paradise."

Paradise was a planet on which a great Foundation, with too much money and too little sense, had set up their utopian ideal of the perfect world for the underprivileged.

Somehow the idea hadn't worked out quite the way expected.

And the space-ship crew, forced to seek help there due to a breakdown in interstellar flight, are the Strangers who have to go to Paradise.

Paradise is a world where robots do all the work—and it's not a story of the revolt of the robots.

Robots, unfortunately, don't have intelligence enough to revolt—even under the conditions on "Paradise!" ■ THE EDITOR.

THE REFERENCE LIBRARY

P. Schuyler Miller

THE GOOD OLD DAYS

As this is written, the first response to my request in the May issue is just beginning to come in. It's too early to say anything definite, but if the present rate continues for the rest of the month there may be more votes than there were in my previous poll. And it is already evident that present readers of *Analog* are voting heavily for the "good new days"—not for the classics of the formative years.

In his companion volume to "Seekers of Tomorrow," the study of a group of the top writers of this formative period, which I reviewed last month, Sam Moskowitz has done an exceptionally fine job of showing how "modern" science fiction developed. "Modern Masterpieces of Science Fiction" (World Publishing Co., Cleveland, Ohio; 1966; 518 pp.; \$6.00) almost lives up to its title. It contains twenty-one good and pretty good stories by the twenty-one authors whose total

work was described and discussed in "Seekers." They are representative of their authors and of the period when they were published, which is precisely as Sam intended. Only one or two are overly familiar, and all but one or two read just as well today as when they first appeared—most of them right here in *Astounding Science Fiction* (as it was then).

Moreover, in an introduction of only eighteen pages that is perhaps the best article he has written, Sam has drawn what the *New Yorker* used to call a "profile" of science fiction in its young adulthood, between 1938 and 1962. If the publisher keeps "Explorers of the Infinite" and "Seekers of Tomorrow" in print—as he should—but lets the anthology lapse, he should transfer this introduction to "Seekers" as a summing up. These were the years when John Campbell, first as a writer—the phase described in "Seekers

of Tomorrow"—then as editor of *Astounding*, pulled American science fiction up by its bootstraps, kicked it in the rump, patted it on the head, bought it a pair of long pants, and sent it out to work for a living. He found new, young writers full of ideas and new, young ideas in such veterans as "Doc" E.E. Smith, Murray Leinster, Edmond Hamilton, and himself.

The selected stories bridge this transition: Smith's "Vortex Blaster" from the old era, one of John's stories as "Don A. Stuart" . . . and then Leinster, Hamilton, Jack Williamson, John Wyndham, Eric Frank Russell, L. Sprague de Camp, Lester Del Rey, Robert A. Heinlein, A. E. van Vogt, an Asimov robot story, Sturgeon, Simak, Fritz Leiber's "Coming Attraction" (chilling however often you read it), C. L. Moore, Henry Kuttner (with the only really poor story in the book—though perfectly typical of the minor magazines it illustrates), Robert Bloch, Ray Bradbury, Arthur C. Clarke, and Philip José Farmer (with "Mother," which brought Freud into science fiction for good and all). Reading or rereading them is very close to reliving those years, when these stories and the kind of ideas they represent were replacing the tired old themes of the Gernsback years.

The 1967 "Hugo" committee, whether it be in New York, Syracuse, Baltimore or some dark-horse hotbed of fandom still not

heard from, should award Sam Moskowitz a special Hugo with Van Allen belts . . . or maybe it should wait until he's done that third and final volume on today's SF greats, with another illustrative collection like this one.

THIRTY YEARS THAT SHOOK PHYSICS

By George Gamow • Doubleday & Co., Garden City, N. Y. • 1966 • 224 pp. • \$5.95

Dr. George Gamow, Professor of Physics at the University of Colorado and a winner of UNESCO's Kalinga Prize for popularization of science (Arthur C. Clarke is another winner), is in his best form in his account of the theories and personalities involved in the development of quantum theory during the first third of our century. Today, he says, theoretical physics is in the doldrums, waiting for another series of hurricanes like the ones he describes here—Planck's concept of quanta of energy, Bohr's quantized atom, Pauli's exclusion principle, Heisenberg's uncertainty principle, de Broglie's wave mechanics, Dirac's anti-particles, Fermi's atomic forces, Yukawa's mesons.

Being Gamow, he manages to make the progression crystal-clear, with a minimum of simple mathematics in the later chapters. He includes a series of libelous sketches of the men whose work he is describing, and a selection of "family" snapshots of them at work and

play. He manages to get across the ferment that was working in all the physics labs of the world during those years, and to destroy the stereotype of science fiction, that scientists are not people.

Unfortunately, the publisher has done him wrong on several occasions, making no distinction between the letter "v" and the Greek "nu," mixing footnote keys into equations, and doing other violence. Perhaps the Pauli Effect (see page 64 of the book) was operating. It shouldn't happen to a Gammow book.

FANTASTIC VOYAGE

By Isaac Asimov • Houghton Mifflin Company, Boston • 1966 • 239 pp. • \$3.95

To get the credits straight, this is a novel by Isaac Asimov based on a screenplay by Harry Kleiner based on a story by Otto Klement and Jay Lewis Bixby (who used to be known—and favorably—in these pages as "Jerome" Bixby). The film may have been released by the time you read this: I admit I'm very curious about how much latitude the good Dr. Asimov really had. Maybe he'll tell us, off the record, at the World Science Fiction Convention in Cleveland, Labor Day weekend.

On the plus side, this is a fast-moving adventure yarn of early Gernsback (a course in every chapter) vintage. On the minus side, it attempts to be a mystery that just

isn't mysterious. It also resurrects that old Ray Cummings gimmick, Type B, the descent into smallness.

A physicist named Benes has defected from an unnamed Iron Curtain country (Twentieth Century-Fox doesn't want to jeopardize European distribution of the film by being too explicit), bringing a fabulous secret with him. "They" try to kill him and succeed only in damaging him: a blood clot in his brain will destroy his memory if it doesn't kill him. So a mismatched crew is miniaturized and sent through Benes' bloodstream in a submarine to find and blast away the clot with a laser. Two doctors, one beautiful technologist, one physicist, one CIA agent . . . one of them a saboteur. And they have just one hour, normal time, before the miniaturization wears off. If they're not done and out by then, sub and crew will return to normal size inside Benes' brain . . .

The real perils are in the fantastic voyage through the blood stream, lymph ducts, lungs, inner ear and other portions of the body, shaken by the turbulent flow of the blood in which they are drifting, threatened by voracious white cells, attacked by antibodies, with the clock ticking back toward zero. The minor hazards are the saboteur's rather clumsy efforts to louse things up so they will turn back. Since he is forever insisting they do just that his identity is no surprise—unless it's supposed to be a switch

to the *most* probable suspect.

From the scenes from the film in the *Saturday Evening Post* condensation, it should be a real thriller! I wish the Good Doctor had been in on it from the beginning.

**THE CAREFULLY
CONSIDERED RAPE OF
THE WORLD**

By Shepherd Mead • Simon and Schuster, New York • 1966 • 245 pp. • \$4.95

Here is the theme of John Wyndham's "The Midwich Cuckoos" as developed by the author of "How to Succeed in Business Without Really Trying," "The Big Ball of Wax," and other more or less faithfully cynical novels of our times. This time, however, it isn't one small English village in which the female population is efficiently impregnated one quiet evening: it's the world.

The idea is precisely the same: womankind will bear the Coming Race, implanted in them by the Rulers from the Stars. Only this time the children are not solemn little geniuses—they are red-rumped baboons, perhaps akin to the baboon-headed deity who impressed the ancient Egyptians on a former visit. And the anti-hero, who doesn't quite defeat them, is a thoroughgoing opportunist who has been living off the proceeds of his exclusive revelations about the crews of UFO's—totally imaginary, but just what the editors want.

Since the author is a writer with

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an eye and an ear for his contemporaries, his people are quite believable and his plot bubbles along nicely. Unfortunately, to tie all the ends up, he has his hero explain all in a twenty-seven-page revelation near the end. Except for minor detail, most of his story was pretty evident to hardened SF folk long before this point—but this isn't, after all, a book for hardened SF folk. For ordinary people, you have to spell it all out . . .

**10th ANNUAL EDITION:
THE YEAR'S BEST S-F**

Edited by Judith Merril • Delacorte Press, New York • 1965 • 400 pp. • \$4.95

Every time the annual Merril an-

thology comes out, I circle it as warily as a fox does a juicily baited trap, trying to figure out what makes it tick? What made Judith Merrill select just this assortment of short stories, novelettes, poems, cartoons (oops! none of them this time), and spent sparkler spangles? Why does it always seem to have some kind of unity that I can't ever pin down, yet is about as diverse a collection as you can get?

This year you get thirty-three—call 'em "items"—as short as Hap Cawood's less-than-one-page "Synchronicity" and as long as Roger Zelazny's unforgettable "A Rose for Ecclesiastes," as relatively conventional as Arthur C. Clarke's "The Shining Ones" and as far out as—for example—J. G. Ballard's "The Terminal Beach." You get stories from the Spanish (José Maria Gironella's "The Red Egg"), Yiddish ("Yachid and Yechida" by the marvelous Isaac Bashevis Singer), French (Romain Gary's "Decadence"), and Czech (Joseph Nesvadba's "The Last Secret Weapon of the Third Reich"), as well as English (Ballard, Brunner, Clarke) and American. They were found in such places as *Harper's*, *Cosmopolitan*, *New Directions*, *Short Story International*, *Carleton Miscellany*, a couple of "girly" magazines (they have words, too—and the good ones have some very good words), and something called *motive*. Two of them, Rick Raphael's "Sonny" (with the telepathic short-

circuit) and Arthur Porges' "Problem Child" (one of the unforgettable little ones), originated here in *Analog*; the opposition are well represented, some perhaps for the last time since they have changed to reprint compendia.

How to characterize all this? Judith Merrill does it herself, of course, in her summation: this is the book that shows how "the distinction between the specialty writer and the writer-in-general has almost vanished." SF (science fiction plus fantasy plus all the borderlines, in the Merrill application) may at last be approaching the point which mystery fiction reached long ago, when any good writer may try his hand at it without condescension, when many do, and when the protectiveness of cult-membership is no longer needed. Even non-initiates can enjoy; even the nonordained can preach.

THE NINTH GALAXY READER

Edited By Frederik Pohl • Doubleday & Co., Garden City, N. Y.

1966 • 203 pp. • \$3.95

If the perennial *Galaxy* anthology has come, can *Analog* be far behind?

The twelve stories in this volume combine the talents of such veterans as Lester del Rey and Damon Knight with those of relative newcomers like Roger Zelazny. It's a particularly good combination, too—best of the three Pohl has done since taking over the editorship.

Opening the book with "An Ancient Madness," Damon Knight gives us a strangely effective variation on the "love conquers all" stereotype. Perhaps only by making such a theme so strange could he make it so acceptable. Philip José Farmer, on the other hand, has a short-short in "The King of the Beasts" that is only an obvious, stretched-out gap that shows nothing of his unique approach. Richard Wilson, another of those revived veterans, introduces "The Watchers in the Glade," a hallucinatory story of castaways in space which *does* sound like something Farmer might have done and is hauntingly effective right up to the last page.

"Jungle Substitute," from Brian W. Aldiss, is a pretty routine version of the mechanized future plot. "How the Old World Died," by Harry Harrison, which follows it, tells the same story all over again more briefly and effectively; it's a nice contrast.

The Pohl touch is as always in "The Children of Night," in which a top public relations counsel ruthlessly sets out to sell the nonhuman—and possibly inhuman—Arcturans to the suckers of Earth. Does it, too, without stepping out of character, or wasting his skills. Lester Del Rey, missing far too long, has "To Avenge Man." In mood and manner it's as far as possible from his "Helen O'Loy" of nostalgic memory, but moves as quietly to

New books by Sam Moskowitz

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THE WORLD PUBLISHING COMPANY
Cleveland and New York

its inevitable end. Roger Zelazny's "The Monster and the Maiden" is another very brief gag piece, but better than Farmer's bit. C. C. MacApp, in "A Flask of Pine Arc-turan," gags his way through a homily on the familiar theme: "There's no reason, it's policy."

"Wrong-Way Street," by Larry Niven, is a time-travel story that twists its way along smoothly but holds no real surprises except for newcomers. John Brunner, in "Wasted on the Young," has on the other hand managed to find a new kind of society and a new twist to the story of the man who thinks he can beat the system and be an eternal teen-ager. And R. A. Lafferty

tops everything and closes the book with a wholly surrealistic vignette of a nightmare economy that makes Brunner's seem staid in "Slow Tuesday Night."

No greats here, but fun to read all the way through. Once upon a time all issues of all magazines seemed like that . . .

Reissues

WALDO AND MAGIC, INC.

By Robert A. Heinlein. Pyramid Books, New York • No. X-1286 • 191 pp. • 60¢

Two short masterpieces, here in the 1940's.

THAT HIDEOUS STRENGTH

By C. S. Lewis • Macmillan Company, New York • 382 pp. • \$1.50

The final, and fantastic, book in the trilogy of space, religion and magic that began with "Out of the Silent Planet" and "Perelandra." Macmillan has taken over the previous Collier (95 cents) paperbacks, added surrealistic covers, and upped the price.

SOME OF YOUR BLOOD

By Theodore Sturgeon. Ballantine Books, New York • No. U-2253 • 143 pp. • 50¢

Ballantine is promoting this reissue as a crime novel, and so it is, but it offers a plausible psychiatric rationale for vampirism. Is psychology science?

THE CURRENTS OF SPACE

By Isaac Asimov • Lancer Books, New York • No. 72-104 • 191 pp. • 50¢

THE END OF ETERNITY

By Isaac Asimov • Lancer Books, New York • No. 72-107 • 176 pp. • 50¢

THE NAKED SUN

By Isaac Asimov • Lancer Books, New York • No. 72-108 • 191 pp. • 50¢

THE STARS LIKE DUST

By Isaac Asimov • Lancer Books, New York • No. 72-103 192 pp. • 50¢

The Asimov avalanche. I don't know how "The Caves of Steel" came to be omitted, unless someone else owns the paperback rights. These Lancer editions have attractive new covers, and "The Stars Like Dust" has an appreciation of Asimov by Sam Moskowitz.

THE WIND FROM NOWHERE

By J. G. Ballard • Berkley Books, New York • No. F-1198 • 160 pp. • 50¢

England's most striking new talent doesn't explain his catastrophes, but he makes you feel them!

A CASE OF CONSCIENCE

By James Blish • Ballantine Books, New York • No. U-2251 • 188 pp. • 50¢

Long (eight years) overdue reissue of the pace-setting novel that wove fine science fiction from a religious theme.

brass tacks

Dear Mr. Campbell:

Your editorial, "Breakthrough in Psychology," was thought provoking and deserving of comment. It is generally recognized that both the White and Negro communities have a long way to go before reaching stability. However, I get the impression that you are stating equality as a scientific fact rather than fact by law. One of your most noteworthy editorials of an earlier date suggested that "If you prove a fact, it is not necessarily true . . . if you cannot prove a fact, it is not necessarily false." It appears that it would have been better to equate the Negro with the American Indian instead of the Chinese and Jews. Your editorial directs itself to a distinction between punishment and torture and the necessity for the Negro community to establish a moral and ethical basis of punishment within its group. My concepts are more to reflect the fact that civilization is torture to the primitive and, one hundred years of being removed from a primitive (or tribal) classification is insufficient time for the Negro, or comparatively, the American Indian.

The end results which are desired, in the sense of the Negro disciplining the Negro to the community standards, would be a satisfactory

conclusion. However, one cannot equate the Chinese, Jewish, or Irish with the Negro culture and anticipate similar results. The Chinese and Jewish cultures existed before Christ and, any European culture, including Ireland, might be dated back to the Roman exploration of the continent. The Chinese and Jews recorded history and had developed law, religion, agriculture, trades, commerce, et cetera. The background of Negro culture is nonexistent by these standards because the primitive of Africa even lagged behind the American Indian, let alone the earliest beginnings of the Chinese and Jews.

Of smaller population, the Indians have their "ghettos" or reservations, and many of them are aware that life beyond the reservation is too complicated, too confusing, and too uncertain in terms of making a living. The ghetto of the Chinese and Jew are the cultures of civilization established a few thousand years ago, who had their rules for integral community living well established and they survived as a comprehensive society. If, alternately, they had been placed in the wilderness without communication with civilization, they would have survived equally well as a progressive community. On the other hand

the Negro was brought to America as a primitive to be kept as a primitive, with resulting American culture by virtue of the fact that this was where he started . . . the Emancipation Act of one hundred years ago. This Act ended the plantation "reservations" and forced the Negro into a culture which would not help or encourage them in any degree. They survived as a broken tribal society, without cohesion and multi-directional in purpose. It is indisputable that many of them were able to rise above their background but, until recent years, the force of initiative and incentive seemed to be lacking in the majority, either through their own circumstances and background, or by the uncaring attitude of the White who even today disregards the Indian.

The Negro of today is the Negro's burden and most of them know it. They are also the White man's burden but they do not know what progression of events should lead to a solution. The Negro must create the rules by which their fellowmen will conduct themselves as an integral part of society. It is a world civilization which imposes restrictions and punishments upon the conduct of man. It is a world which the Negro must be part of and he must start with the recent past and catch up on two thousand years of history. It is a superhuman task and burden which confronts them and it is hoped that they will carry it with the dignity it requires. It is possible

that the demands which sound unreasonable may be far more reasonable than we now believe, but the methods of accomplishment require the restraint of reason.

I do not believe that this or any problem will ever really be solved except on a temporary basis. The solution of today is always confounded by the stresses and strains of tomorrow's generation. The instability of life, science, government, and civilization dictates this truth. For instance, the history of science itself has shown absolute, incontrovertible facts and theories to be absolute hogwash.

If civilization arrives at a juncture one thousand years from now, the powerful forces of natural phenomena, evolution, and man will have changed the face of the Earth, nations, and peoples. *Life is the process of searching and looking for the ideal.* We do not know what the ideal is and, it may be for the Universe to determine that which is ideal. After viewing the bones of dinosaurs, I would hesitate to say with absolute conviction that man is Nature's ideal form of life . . . in spite of man's obvious tenacity, adaptability, and power to reason. We may all say, someday, that there really was something better before us or, we may be grateful that the future was not ours to endure.

It is on this basis that I believe that the Negro will have his opportunity and, if it is to be tomorrow, it might just as well be today if they

are ready to accept full responsibility for progress in the community, the nation, and the world.

RALPH J. LODGE

Queen Anne Road,
Harwich, Massachusetts

And no matter how you slice it—it comes out “The Negro must do it for the Negro—the white man can not do it for him.”

Dear Mr. Campbell:

I have been reading science fiction since Hugo Gernsback started *Science and Invention* magazine, and long considered *Astounding* to be the very best. In recent years my reading has been rather sporadic, but when I do pick up a copy of *Analog* from the newsstand, the first thing I turn to is the editorial. I have found them very interesting and thought-provoking, not that I always agree with you. In particular, one of the recurring themes is that survival is in some way a measure of worth. Every one who really thinks so should reflect on the expression popularly stating Gresham's Law, “the bad drives out the good,” and make some analogies.

J. L. HARPER

4816 Moss Point Road
Dallas, Texas 75232

Maybe because there's always more ways of being wrong than there are of doing a thing right!

Dear Mr. Campbell:

About the nature of literature: among other things, you ask why

graduates in literary subjects are unlikely to be good writers. I graduated from Oxford in Modern Languages, largely a literary discipline, though with some linguistics, and I think the answer may be like this:

Literature students are confronted with classics at an age when they can have no appreciation of what makes them worth reading over for centuries: I was confronted with Corneille, Racine and Baudelaire at the age of twenty, when I had faced no public or private responsibilities, had very little experience of women and had never suffered even mild melancholia, and could no more be expected to understand the success of these writers than a total innumerate could be expected to understand why the invention of zero changed the world. At this time, Hammett and Hemingway, appealing bang directly to feelings of inferiority in the fighting and dighting situations and offering a sort of proxy knowingness about the runaday way of the world, truly had more to give me. But I was all along forced to admit the possibility that my taste could be wrong, or at best grossly immature. My own efforts at writing, and I did get a lot of student writing published, were paralyzed in the end by a sort of perfectionism in theoretical standards of self-criticism, a paralysis of the writing will derived from the near certainty that I was writing badly without myself knowing how badly. And a writer needs, I should

say, confidence in his powers of self-criticism more than he needs anything else except the muscles of the gluteus maximus.

Lawyers and physicists are spared at least this difficulty. Moreover the young ones, at least, seemed to me to enjoy the illusion that human affairs and the universe make some sort of discoverable sense, while the close study of classic literature early induces pessimism.

Surely you are joking about sex in suburbia. "Lord of the Flies," after all, went down pretty well with your literati; and this flip fable is grounded on the Augustinian pessimism which, by your leave, make Baudelaire, Flaubert and Camus more modern than Verne, Wells and Gernsback.

It seems to me that the most admired modern writing starts at the point where the writer realizes, in Samuel Beckett's lapidary line, that "they give birth astride the grave." In other words, that the life of the individual makes no discoverable sense, to himself, to his analyst, or to anyone else, except perhaps to a God who is no longer easily found, or put to the question. We have come to the point where most people have to try and find out what to expect, and what is expected of them, by reading pop sociology in *Time*, or perhaps not in time.

In capsules: Golding shows the agony without the answer, doesn't believe there is an answer; Bellow shows the agony and the search for

the answer; most science fiction assumes the agony and, too confidently for me, presents answers—this is how things are, it says. Your own editorial policy brutally assumes that the individual does not matter, but that his thoughts or actions, in so far as they are operative in the social context, both crosswise and longitudinally in time, may matter: combinatorial analysis matters, Pascal's carcinoma and unhappiness not; the man on horseback matters when his followers change society, his fears of oblivion do not.

But *Astounding* (as it still is to me) does make you think, out and ahead; "The Carpetbaggers" is more like a lobotomy or liquor in its effect on the forebrain. So far, I go along with you, as I have for many years.

GRAHAME LEMAN

9 Tudor Court

Gunnersbury Avenue

London, W. 5, England

Perhaps it is a case of "Too much respect for your elders keeps you from finding they didn't have all the answers."

Dear John:

I want to congratulate you on "Break-through in Psychology."

Like you, we were also startled by *Life* magazine again demonstrating its tremendous ability by discovering the discovery at the California clinic.

All this had the end effect of disturbing the usual serenity of our household. You see, my wife is tak-

ing some terminal courses at the local Teachers College, with a view toward getting a teacher's certificate, and for some months, she has been in the habit of coming from class and saying to me, "Who's nuts? Me or that faculty? Or are we just so old and duddy-fuddy we can't understand the new method?"

The "don't punish the child because you will bruise his ego" doctrine has been applied on a gross scale to U.S. education. At the normal colleges there is more of it than there is out in the schools; this because the doctrine of the educational high priests takes a while to penetrate the boondocks. The professional educators are all too prone to admit that "there still are too many old-fashioned teachers in the school systems." Old bats who won't give up on such petty issues as grading and competitive accomplishment in the classrooms.

In Chicago, we have a purer opportunity to make scientific observations of the results of the non-discipline method, than perhaps you do in New York. We have a very tightly autocratic school system which takes far less interference from parents and other elders of the community while in New York, you will still see organized protest. Thus we have quite a few high-school graduates now riding around who have spent perhaps eight years under a continuity of education a-la new method.

The results are pathetic. These

kids barely know how to fill in their unemployment compensation forms. Math? What's that. And reading? Who needs it when you can watch TV? A few employers complain about having to import help from small country towns, or from Europe. And we see now and then, Birchers and other right wingers looking around the Normal Colleges for evidence to support their contention that the Commies have sabotaged the education of American youth.

But being on the inside track, we know there is no direct Red connection between liberal education and liberal politics. We know that what we are looking at is the tail end of a very long sequence of ideas and semantic reactions that stretch back to the pre-Dewey era.

At one time, we know, there were schools and teachers so strictly set up that a good many talented kids were washed out without a crack at a second chance. Whether or not the washouts often became great inventors and businessmen is of no consequence. The fact is that the early progressive educators decided to do something to help these unfortunates. Psychology was then a new fad . . . people trying to make a living in psych were clutching for any kind of a gimmick that would help them to get office space in the big schools, and so this was it. The idea was popular with parents and relatives of slow-starting and slow-learning kids, and so a quiet intel-

lectual's theory became in forty years the doctrine that today makes a mishmash out of most big-city U.S. schools.

So we as observers in 1965, having this and more in our fact book, still find one big unanswered question. The question goes like this: "Sure, we can understand how fads expand, and how Americans tend to buy anything. That's easy. But how can you explain the fact that 100,000 or so professional psychiatrists, psychologists, and educators all cling to an idea that is basically, in the light of all human experience, silly, foolish, et cetera."

The answer to this question does not come easy, because when we think of the professional psychologist, the professional educator, or the psychiatrist, we hark back to the Webster definitions of those job titles. Such men are supposed to know all there is to know about the human mind, and, therefore, we are too liable to jump to the conclusion that they must also be good thinkers.

They travel in scientific clothing; they have labs, white coats, and learned societies, and we are liable to conclude that they do a thorough job of data-gathering, history-studying, and that their conclusions are solid.

Both of these popular assumptions are completely misleading and

false. You do not have to be a straight thinker to be a psychologist. You don't have to be a practical citizen to qualify as an educator. To obtain a Ph.D. in either of these fields, you need not, in fact you better not do any original work. Proficiency in copying, paraphrasing and bibliographing the papers of others is the main hurdle.

In fact we find that at the normal schools, it is the ability to parrot the sayings of the high prophets, that earns one the fastest M.A. or Ph.D., and we find that a student who questions the system is soon weeded out.

Very little time is spent in teaching teachers how to inspire creativity, how to handle the gifted, how to make every classroom hour count. Rather the fledgling teacher is constantly told that the goal is to cultivate a kind of togetherness, labeled "social adjustment," in which there is no place for individual punishment, embarrassment, or competition.

The prophets in the field of education and psychology, men like Freud no matter how goofy he was, men like Jung, Adler, Dewey, and the rest were at least individually creative, and they had the courage to come up with new ideas.

Their followers are not cast in the same mold. Men working in the physical sciences look up to their heroes, the great inventors and

physicists, and I think quite universally, they try to emulate them by also being creative, by thinking somewhat independently at times. But this is anathema in education.

A sheeplike conformity is required of the psychologist and the educator and perhaps this is so because the leaders of the profession know that they still hold very shaky ground. The principal of the local school puts up a bold front when he tells a local mother, "You aren't qualified to understand why we are handling your little John the way we are."

And I think he does this because he knows that it would be very dangerous to his profession to allow any boat rocking to take place. And maybe he and a lot of his contemporaries really do know there is something very bad about school systems that turn out so many poorly educated and poorly skilled kids. But give them tests and little proficiency exams that prove they are up to par, to palliate questioning parents. And watch out for P.T.A. investigation committees!

Like in medicine, like in some branches of engineering, at the management level of the psychology and education professions, there is well entrenched hierarchy of administrative people, and let's face it, they aren't too bright.

On the administrative level, you don't find brilliant, gifted teachers. Inspired teachers who want to improve education are a rarity in the

normal schools—they are nonexistent on the faculties of the education departments at the big universities. And as long as no group of angry American parents raises a hue and cry, as long as the true facts can be covered up with "research studies" and other professional gibberish, a very happy group of well-paid loafers will continue to enjoy a plush existence while little Johnny's progressive education gets progressively worse, year after year.

This is what we have discovered, investigated and confirmed—this is what has disturbed the blissful serenity of our private ivory tower this fall season.

BILL MCHUGH

5010 N. Monticello,
Chicago, Illinois 60625

The search for security begins with an effort to enforce stasis—which is easiest when there is conformity!

Dear Mr. Campbell:

Now that the physicists, chemists, et al, have had their say about that poor little bird's toes, perhaps we behaviorists can help solve the problem.

A bird is not a metal rod, nor is it an isolated hunk of isolated tissue. It is dynamic—it moves—it exhibits behavior. Even while it is asleep, clutching a cold branch, in sub-freezing temperature, it follows a definite pattern that evolution has provided for its survival.

In cold weather, when a bird sleeps, it crouches down very low. It

balances on one foot, holding the other foot tightly against its body, under those soft, warm, insulating feathers. This serves to keep the unused foot warm. The foot the bird is standing on is also covered, for the crouched position causes the foot to be enveloped by the feathers of the lower part of the chest. The foot then has double insulation—scales and feathers—and only a very tiny portion of each toe is exposed to the cold, circulating air. A good portion of the exposed toe is composed of nail tissue. And, of course, the bottom surface of the foot is entirely exposed to the cold contact of the branch. However, the laws of entropy decree that heat pass from a warm body to a colder one, so, in time, that particular portion of the branch becomes slightly warmer than it was when the bird first put its foot there. (The slight heat is kept, just as the portion of our beds warm up under our bodies, and, although the surrounding parts are so cold, under us the warmth remains.)

But it does not end there—another evolved protective device operates to keep the bird's foot from freezing. After a while, the foot gets tired, so the bird lowers its warm, unused foot, grips the branch with it, and draws the cold, tired foot up against its warm body, under the insulating feathers. When the second foot gets tired, the bird changes again.

There are some other features of bird behavior, too, that contribute

to nighttime comfort. Many species of our Northern birds sleep in groups during the winter—the collective body heat raises the temperature in the area considerably, and all those little feet help warm the surface of the branch.

Occasionally, a crippled or injured bird has to keep both feet down all night. In this case, the added insulation of the chest feathers, plus any extra warmth if the bird is part of a group, helps make the night comfortable.

Birds are very tough little creatures. Temperate zone birds can withstand a wide variety of temperatures. Their most vulnerable parts are their eyes. During cold winter nights the eyes are buried deeply in the jungle of feathers on the back. (No, the head is not placed under the wing. A raised wing would expose the unfeathered juncture of wing and body, and cause wasteful loss of heat. The thickly-placed back feathers are raised, the neck is folded back, and the head is placed so the eyes are almost touching the skin. To an observer, the head is invisible, with the hump of the neck tilted in such a way as to make one believe the head is under a wing.) The eyes receive full benefit of the body heat plus the insulation of the feathers. The bird breathes in warm air filtered through the feathers and breathes out warm air, which helps maintain heat, too. (It doesn't suffocate as a person would with his face in a feather pillow, because the

bird's feathers are not so densely packed, and outside air currents cause circulation inside the feather-mass, too.)

So, you see, there is more involved in keeping a bird's foot from freezing than laws of thermodynamics, principles of insulation, and freezing points of tissue. For the full picture, you must add to the above the vital, dynamic factor of behavior.

ROSLYN WOLDIN

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Brooklyn 35, New York

Well, that may explain why a bird's toes don't freeze—but I can't quite call that a "comfortable" way to spend a night. "Survivable" maybe—but hardly "comfortable"!

Dear John,

I have been following the "birds feet" discussions in Analog with interest. I think this is one of the "Great Mysteries of Nature" that I first noted. When I was about twelve years old, I watched out of my window a downy woodpecker getting food of some kind out of the bark of a black walnut tree with the outside temperature in the 0 to -10 degrees F range. After I had observed this bird for over twenty or thirty minutes I began to wonder about the feet freezing problem. I have yet to find an answer that seemed correct. When I asked my father about the downy woodpecker he promptly said, "Birds feet are too dry to freeze." I could-

n't accept that then and haven't changed my mind.

In the April Analog, Barry Bunow threw in a lot of observations but in my opinion added more to the mystery.

The best information I have seen presented on the subject is an article in the January '66 issue of *Scientific American*—Page 94. The author, Laurence Irving, presents some pertinent and logical information. His conclusions certainly substantiate Barry Bunow in his contention that the bird cannot afford to divert heat from the central body to warm the exposed feet. The article also answers Bunow's thermodynamics point. (page 96 & 97)

The *Scientific American* article, though excellent, still doesn't completely answer the question: "Why don't birds feet freeze?"

Page 97 of this article includes three illustrations. One is a sea gull at outside air temperature of -16 degrees C. Body, leg and feet internal temperatures are listed—with feet approaching 0 C.

Irving indicates that it is a peculiar kind of fat that keeps animals' (he doesn't mention birds) feet from freezing. He then goes into the matter of nerves and sensitivity in animal extremities at very low temperatures. That's another mystery!

LAMAR PEEPLES

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They talk all about the subject—i.e., around it, but not of it!

POLLUTION

continued from page 7

the power consumption of those multi-billions of people will be enormous. But power, whatever it's used for, almost without exception turns into heat in the end. If they have a lighting device that's one hundred percent efficient, and turns every watt of input into visible light—the only fraction of that that doesn't get turned into heat will be the minute fraction that escapes out a window on the outer surface of that multi-layered city, and so escapes into interstellar space. All the rest becomes heat.

Trantor, as it grows, will have to be moved farther and farther from its sun in order to allow a radiation balance with interplanetary space that's still within the biologically tolerable zone. Eventually, Trantor has to be moved completely away from any star so that it can radiate freely.

And then there has to be a second Empire capital, whether the Second Empire comes along or not.

One of the factors that leads to the pollution-concentrates around cities is the increasing heat-output. I once calculated the energy release of New York City on a normal January day—the heat released by the fuel used to warm the buildings, to run the subways, the trucks and buses and automobiles—the ordinary daily heat-budget of New York City. It worked out to something

like the equivalent of a four megaton fusion bomb per day.

Man is, indeed, changing his environment—but not to suit himself this time. Because the July-August heat budget isn't really vastly different! It's not just the building heating, remember—the trucks, buses, automobiles, subways, and industrial plants, the elevators and building illumination go on very much the same. And air-conditioners don't cool things; they're simply heat-pumps that dump the heat outdoors again—plus the added megawatts of energy used in doing that pumping!

All of which has a tendency to change the local weather patterns slightly, but significantly. I live some twenty-five miles outside the city; usually, when it snows in my home area, it's raining in New York.

Forty years ago, this wasn't as common.

But the heat-death that will force the Empire to abandon Trantor isn't the thing that's hitting us hardest. It's the fact that the ecology of *mechanistria* hasn't yet evolved adequate scavenger machines. The *only* area in which *mechanistria* has evolved adequate scavengers is in the species *mechanistria nucelensis*. That particular variety of contaminants is not necessarily much more lethal than sulfur trioxide, carbon monoxide, nitrogen peroxide, et cetera, that is poured out by burning fossil fuels, and the vapors of lead bromide from gasoline engines, but it was unfamiliar and caused

much public attention. So scavengers of the mechanistria tribe were called into existence. Nuclear power plants are the only kind that don't pollute the atmosphere, or water, of the area.

In New York, interestingly, the City-owned waste incinerators seem to be the worst offenders in pollution generation of the particulate type. That follows from the usual system of political systems being very keen-eyed at spotting other peoples' faults, but amazingly obtuse at seeing their own.

Consolidated Edison, because it consumes more fuel than any other organization in the city—it supplies not only electric power, but steam for heating and power, and gas—is naturally the worst offender in terms of sulfur oxides, and assorted other contaminants produced by partial or complete oxidation of fossil fuels. (The ash of coal contains practically all the elements in the table, of course, with appreciable quantities of such things as germanium, boron, lithium, barium, and other things we don't ordinarily think of.

But that's in terms of the worst *single* organizations. The really bad ones, of course, are the tens of thousands of automotive vehicles, those buses, trucks and automobiles that pour extremely toxic materials into the atmosphere.

The internal combustion engine is an extremely inefficient way of burning fuel; the conditions are anything

but good for complete combustion.

An item even many professional chemists are not aware of is that if you burn oxygen in an atmosphere of methane, you do *not* get what you get when you burn methane in oxygen or air. Burn methane in air, and you can expect to get practically one hundred percent water and carbon dioxide. But burn oxygen in methane, and of course you get some water and carbon dioxide—but you also get a high percentage of complex organic products: acetylene—methyl and ethyl alcohols, acetic acid, ethylene and various esters, ethers, alcohols, ketones and aldehydes. The reason for the difference is, largely, that the methane molecules are subject to high temperature and contact with oxygen for only an extremely brief time—time enough for partial oxidation, partial dehydrogenation, but not long enough for combustion. So the gases stream out as free radicals hungrily seeking something—almost anything—to link up with. Some of the new-formed water molecules are attacked by highly energized free radicals and alcohols result. Other heavily attacked methane radicals combine to form acetylene. All sorts of complex organic molecules result due to the extremely hurried, high-temperature-followed-by-quick-cooling conditions.

The internal combustion engine produces the same sort of conditions in the cylinder. But since air containing nitrogen, not pure oxygen is in-

volved, all sorts of nitrogen compounds also appear—particularly nitrogen oxides. Since lead has been introduced, various catalytic effects occur, and the lead comes out in the exhaust largely as a haze of lead bromide.

Bromides are supposed to be good for headaches; that lead bromide is guaranteed to be good for the headache, but not for you.

Now we could get away with all that pollution—so long as the number of cars sold was low, and they were well spread out. Los Angeles has a hopelessly inadequate public transport system, and has been forced to rely on private automobiles, so Los Angeles was among the first cities in the world to really feel the sting of the toxic products of pollution generators. The peculiar topology of the Los Angeles basin exaggerated an inherently bad situation.

The problem is, simply, that the mechanistria tribe hasn't evolved an adequate variety of "dung beetles."

Now in the animal kingdom, there are very few organisms that exude by-products so odorous as to be readily noticeable at considerable distance. Some of the more dangerous carnivores have scent glands that they can use at will; they aren't much afraid of having someone scent them and come looking for dinner. The skunk isn't a bit worried about having carnivores smell him; with him, the odor is a warning signal.

But generally, the animal kingdom has policed up its metabolic by-products to a point where they're pretty fairly inconspicuous. The ones that didn't were either detected and eaten too readily, or detected and avoided so they starved.

The mechanistria tribe hasn't been adequately preyed on. If there were some large and powerful member of the tribe that pursued stinkers, caught, and munched them up for scrap steel now . . .

And that, in essence, is precisely what various political bodies are getting around to doing! If they pollute the atmosphere . . .

"Fee! Fi! Fo! Fum!

I smell the stink of an auto bum!

Be it new or be it old

I'll grind its steel for a brand new mold!"

It's very simple; there's no excuse for poisoning the atmosphere, and the human race simply can't tolerate it.

Mechanistria has to develop some form of dung-beetles, whether we—and the automobile industry—like it or not we *have* to. We simply, flatly have no other choice; the stinkers must go—or we will.

One item that needs some real study: I noticed when I was in Ireland and England two years ago, and specifically paid attention to the point when I was there last year, that the big buses in their cities *do not stink*. The familiar reek of American Diesel buses—an effluvia of

aldehydes, acids and ketones that sears the sinuses and gags the throat—simply isn't characteristic of English-made Diesel engines.

I haven't the slightest notion what the difference is; the English may have some sort of exhaust burners installed, or a different form of fuel injection, or combustion chamber—I've no idea. But I urgently suggest that the Cities of New York and Los Angeles simply pass a ruling that only English-made Diesel buses and trucks be accepted in those cities, until such time as GM, Ford and other United States companies develop a non-stinking Diesel engine.

I think the speed with which the United States motor industry would rise to the challenge would surprise everyone.

There's nothing like a flat challenge of "You aren't going to sell any more until you cure that stench," to get research done in a hurry. Particularly when you add, ". . . and don't tell me how impossible it is, because I've got one already that doesn't stink."

If just those two cities passed such a ruling—and God knows they desperately need to reduce pollution!—the air of all the cities in the United States would be greatly improved in a remarkable hurry.

We got into this gaseous mess because of the failure of the electric and steam automobiles early in the century. Primarily, that failure resulted from the fact that the steam

and electric-car manufacturers accepted, and stuck with, the doctrine that automobiles were an aristocratic luxury for the rich—not for the use of everyone. Henry Ford had to break the Selden patents to get out from under that doctrine with his Model T, but the steam and electric cars never did get out and go to work.

Now the internal combustion engine is lighter than the steamer, and unlike the electric, it's a prime mover. Also, the gas engine was the only one available that increased its torque as the speed increased; both electric and steam engines develop maximum torque at zero speed. The internal combustion engine continues to gain in power output as speed increases, and as the power-demands of the vehicle increase.

Unfortunately, it is also the one of the three that inherently generates the most deadly exhaust fumes. A properly adjusted burner in a steam engine gives off practically nothing but carbon dioxide and water vapor, if you simply feed it a clean fuel. An electric, of course, gives off no fumes, if it's operated properly.

If Henry Ford had decided to build a cheap, everyman's steam car, it almost certainly could have been put over. And ninety-five percent of the present automobile pollution would never have arisen.

The electric could never have made it; batteries are too heavy, too expensive, and too short-charged.

However, I suggest a very simple remedy for the situation as it is. It will take a real R & D project, one which won't show any return, but actually an increased cost, so it would be undertaken with the very greatest reluctance, and with minimum goals, unless real pressure is put on. The great trouble is that automotive engineers are that because they're genuinely emotionally and intellectually convinced that Automobiles Are Wonderful Things. They believe in them. It's not just the dear old cliché argument that everybody seems to think answers all disputes—the "They want their profits, that's all!" They're dedicated to the perfection of the machines they believe in.

Getting them to make really basic changes requires that they abandon, in large measure, the things they've devoted a lifetime of effort and study to—the things through which they've achieved real satisfaction.

Now suppose a law is passed that no vehicle shall be considered fit for human use until it has passed a sealed-room test. This test is to involve running the vehicle in a completely sealed room at its rated cruising power for a period of five hours, with the chief engineers of the production and research and design departments in the room with the vehicle. The sealed room has an air intake feeding directly to the air input to the engine, and arrangements for cooling, for carbon di-

oxide absorption, and dehumidification.

Heat, water and carbon dioxide by-products are permitted. Anything else is going to accumulate, and make the engineers responsible for its design and construction acutely unhappy.

To pass that test, they're going to have to come up with some *mechanistria* scavengers that really scavenge—or an engine that doesn't pollute in the first place.

A fuel-celled electric car, based on that Westinghouse yttrium-zirconium oxide air-and-any-gaseous-fuel cell could pass that test fairly readily, with a clean hydrocarbon fuel—i.e., one that had been freed from sulfur, et cetera, contaminants. Commercial techniques for doing that are available now.

Gasoline engines aren't the only possible means of operating vehicles—but we'll never get away from them to something we can live with in our cities until some really massive pressure is put on the automobile industry.

Not because of profit motives—because the men who work with them love their gas-buggies. Ask a real hot-rodder, who's labored to build his own super-special job what he plans to sell it for. "Huh? Sell it!? Are you nuts?"

Such people make very bad Marxists. They defy Leninism. No profit motive. No economic motivation.

And try getting him to switch his love to an electric! ■ The Editor.

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